

OPERATION MANUAL FOR VIDEO DISPLAY TERMINAL MODEL VA120



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PREFACE

The VA 120 display terminal is a high quality full feature unit, offering complete plug-in compatibility with the DEC VT 131 / VT 100 in operation and in software. Operation is made easier with the VA 120's customized, detached low-profile keyboard in which all LED indicators are identical to those of VT 131 software is compatible since all codes and features are identical. In addition, features such as selection of double height/double width characters, 80/132 column screen, and smooth scroll/selectable scroll region have all been designed to match those in the DEC VT 131.

Moreover, there are many features standard in the VA 120 which are optional or not included in the VT 131. These include 20mA current loop and RS422 interface, and screen saver.

The screen saver function turns off the display after 10-30 minutes of non-use and restores the display by pressing any key.

The VA 120 is designed to be interfaced easily with various serial printers. The buffered printer interface, which is built-in, permits a wide choice of independent print/communication Baud rates and parity. The XON/XOFF control line (protocol) allows printer busy to be monitored, and allows the VA 120 to be used as a controller between the host computer and the printer.

These features make the use of your computer system more convenient and efficient. Read this manual before using the VA 120 in order to understand its many capabilities.

NOTE: VT131/VT100/VT52, DEC and DIGITAL referred in this manual are registered trademark of Digital Equipment Corporation (USA).

Chapter 1 Operating Information

(I) GENERAL DESCRIPTION: TERMINAL OPERATION.

The VA 120 can be used as either an interactive or an editing terminal. It operates on-line, off-line, or in SET-UP. The communication line to the computer is open only when the terminal is switched on-line. When the terminal is off-line, it does not communicate with the computer, although characters typed are displayed on the video screen.

When on-line, the VA 120 terminal can perform both input and output functions. As an INPUT device, the terminal can be either:

Interactive, in which the computer automatically receives keyboard entries through the input character buffer; or an Editor, in which case characters are displayed on the screen and can be edited but are not sent to the computer until the command is given.

As an OUTPUT device, the VA 120 terminal displays characters on its screen or prints them after they have been received and processed through the buffer.

An optional serial printer can be connected directly to the printer interface to produce printed copy. No separate line or interface is required. The printer line can be used whether the terminal is on-line or off-line.

(II) CONTROLS AND INDICATORS

The controls and indicators are grouped as follows:
Monitor ON/OFF control
Keyboard controls

Keyboard LED indicators
Audible indicators

1. THE ON/OFF POWER SWITCH.

The switch is on the front bezel (Figure 1-1) and controls the AC power to the terminal. When the power is switched on, the terminal automatically displays certain information:

- (1) All keyboard indicators flash on and off.
- (2) Either the on line or off line keyboard indicator turns on.
- (3) A bell tone sounds.
- (4) The cursor appears on the screen's upper left corner.

When the power is switched on, the terminal automatically performs a self test and "TEST OK" is displayed on the screen when it operates correctly. Any error found in the test will be indicated by one of the followings:

- An interruption in the procedures listed above
- RAM or ROM test down displayed on the screen

2. KEYBOARD CONTROLS.

The VA 120 terminal has a main keyboard and a numeric keypad (Figure 1-2)

2-1. Standard Keys

Both the main keyboard and the auxiliary keypad

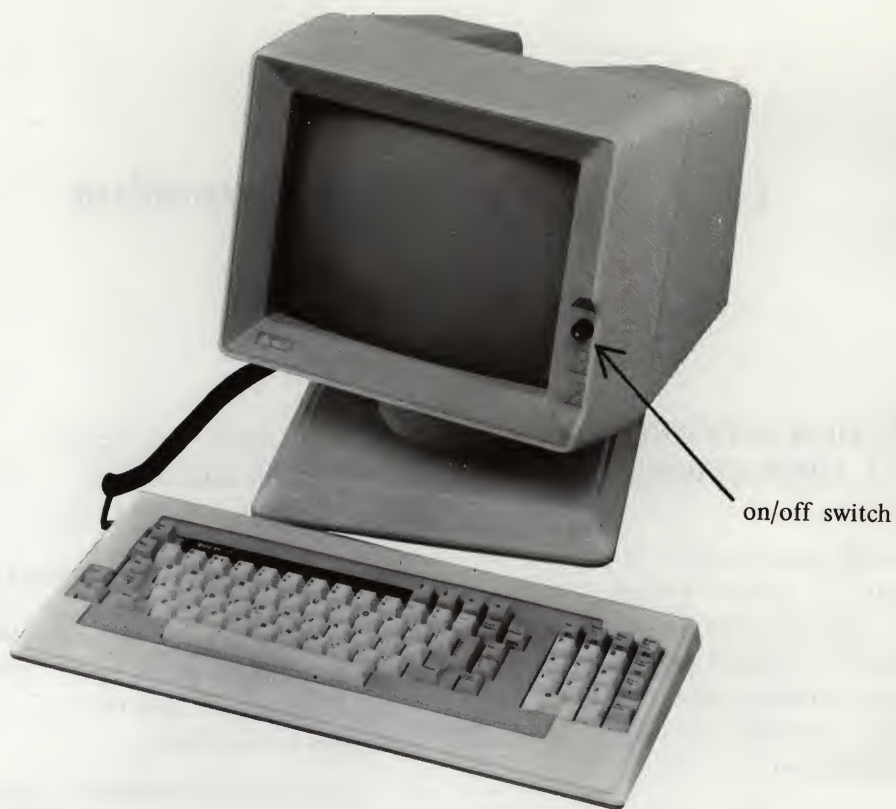


Figure 1-1 Monitor Control

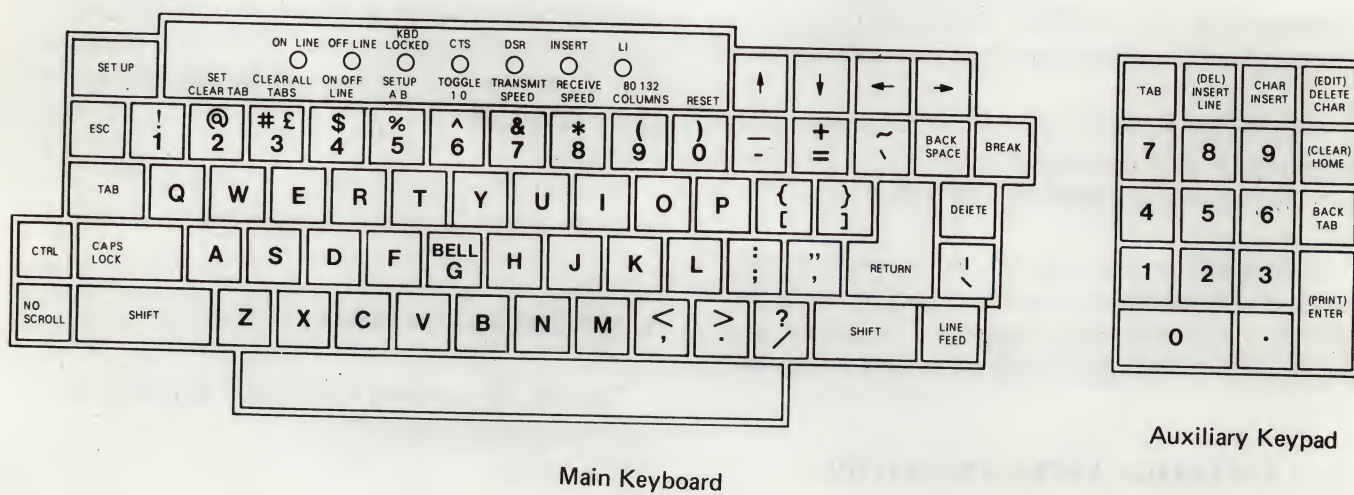


Figure 1-2 VA120 Terminal Keyboard

contain keys which generate standard characters (see Figure 1-3). The main keyboard also contains SET-UP keys. Each of these keys is described in detail below.

The auxiliary keypad has both standard numerical keys, function and editing keys. The printing and editing keys can be used when the terminal is in either editing or printing mode.

The standard keys on the main keyboard have both a lower and an upper case. Standard keys are shifted to upper case using either the **SHIFT** or the **CAPS LOCK** key. Neither **SHIFT** nor **CAPS LOCK** affects the keys of the auxiliary keypad.

SHIFT and CAPS LOCK

Modify standard keys on main keyboard to uppercase.

2-2. The Interactive Function Keys

Refer to Figure 1-4 to see which keys are interactive function keys of the VA 120 terminal. The use of function keys depends on the software or communication system used in each case.

Function keys are used to transmit function characters to the computer when the terminal is in an interactive mode. Chapter 5 of this manual will give a more complete explanation of the function keys. What follows is a brief description of their general use:

NO-SCROLL Key

The **NO SCROLL** key controls the scrolling of lines on the terminal screen. When the key is pressed at the

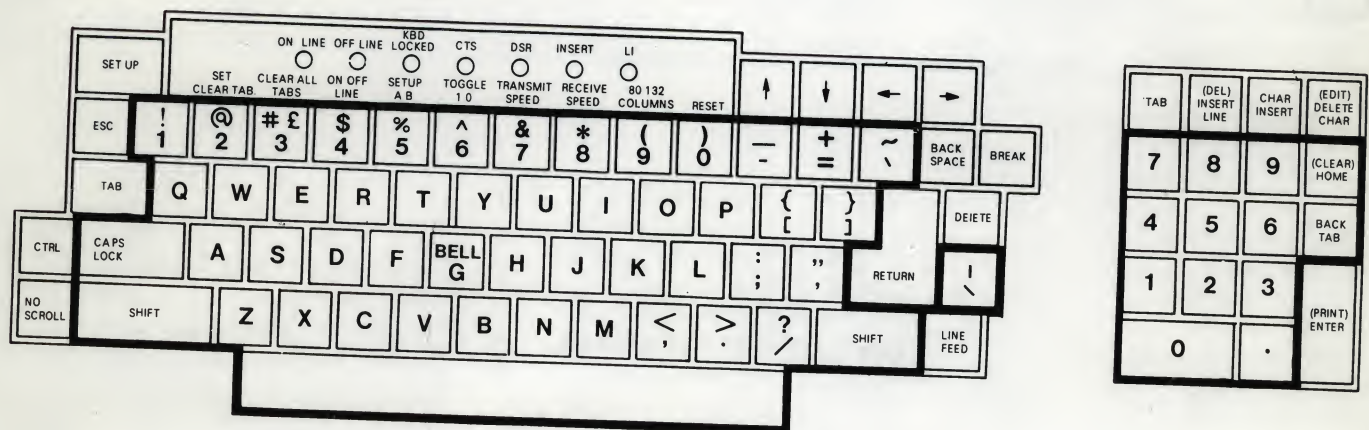


Figure 1-3 VA120 Standard Keys

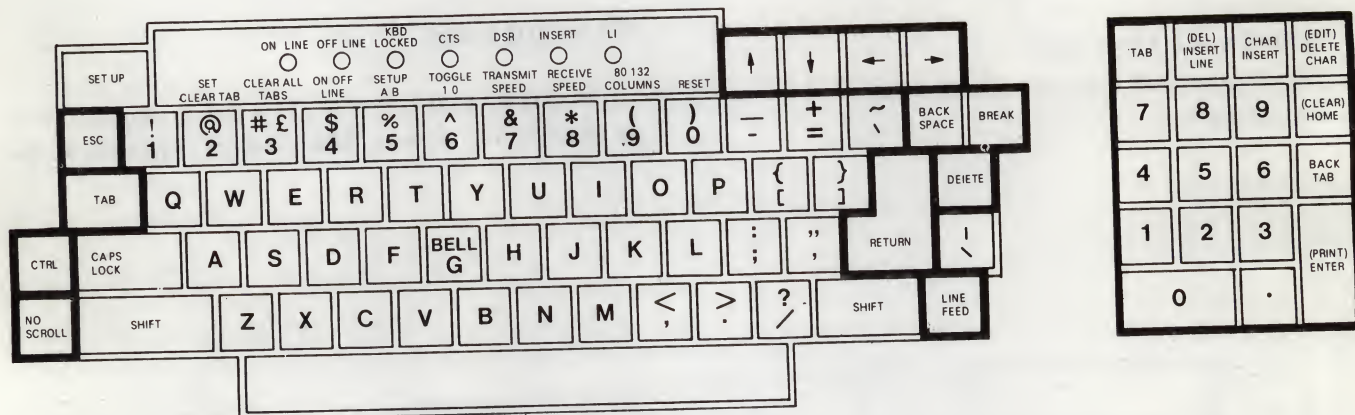


Figure 1-4 VA120 Function Keys

first time, the characters on the screen stop scrolling and no new characters may be added. When it is pressed again, the lines of characters may be moved upwards or downwards and new characters may be typed into the screen.

When in half duplex communication this key does not function. Use the **NO SCROLL** key only when in full duplex communication with SET-UP XON/XOFF feature on.

BREAK/HERE IS Key

The **BREAK** key, when the **BREAK ENABLE** SET-UP feature is on, transmits a break signal. Please note that if the break-enable feature is off, the signal will not be generated. Refer to chapter 4 and 7 for more information.

The **BREAK** key is affected by the **SHIFT** key. When the **SHIFT** key is pressed down, pressing the **BREAK** key will cause a long break disconnect. In some cases this can also lead to a complete disconnect of the communication line. (See Chapter 7)

The **BREAK** key is also affected by the **CTRL** key. When the **CTRL** key is pressed down, pressing the **HERE IS** key will cause an answerback message to be transmitted. (See Chapter 4)

DIRECTIONAL Keys

Directional keys: ←, →, ↑, ↓ are used to move the cursor around the screen. The cursor indicates where the next character will appear. More specific uses for these keys may accompany the application software.

CTRL KEY

The **CTRL** key, when pressed down, may cause a change in other keys. These keys may then produce a control character, the use of which is determined by application software. For a list of control characters see Chapter 5.

RETURN Key

The **RETURN** key can either cause a carriage return or it can generate a CR (carriage return) and LF (line feed) character. The characters transmitted by the return key can be determined by the line feed/new line SET-UP feature which is explained further in Chapter 4.

If half-duplex coded control (HDX B) is selected by the modem control set-up feature, pressing the **RETURN** key may also produce a line turnaround character. This function is activated by the auto turnaround SET-UP feature and the character is selected by the turnaround/disconnect character SET-UP feature. More information about these features is in Chapter 4.

2-3. PRINTING Keys

Printing in the serial printer is controlled by three keys (Figure 1-5): The **PRINT/ENTER** key, the **CTRL** key, and the **SHIFT** key. To hold down **CTRL** and press **PRINT** key can activate the auto-print (line-at-a-time printing). The **PRINT** key is also used to select print screen operation when the **SHIFT** key is down. The printing control keys on the terminal are only used to activate printing and do not transmit data to the computer. See chapter 2 for a detailed description of printing.

2-4. EDITING Keys

A numerical key may be selected either from the main keyboard or from the auxiliary keypad. Keys used in editing are indicated in Figure 1-6. These are:

NO SCROLL

The **NO SCROLL** key is used to stop scrolling on the terminal's screen. When pressed the first time, no new lines or characters may be admitted to the screen; when pressed again, the no scroll is released and characters will appear when typed.

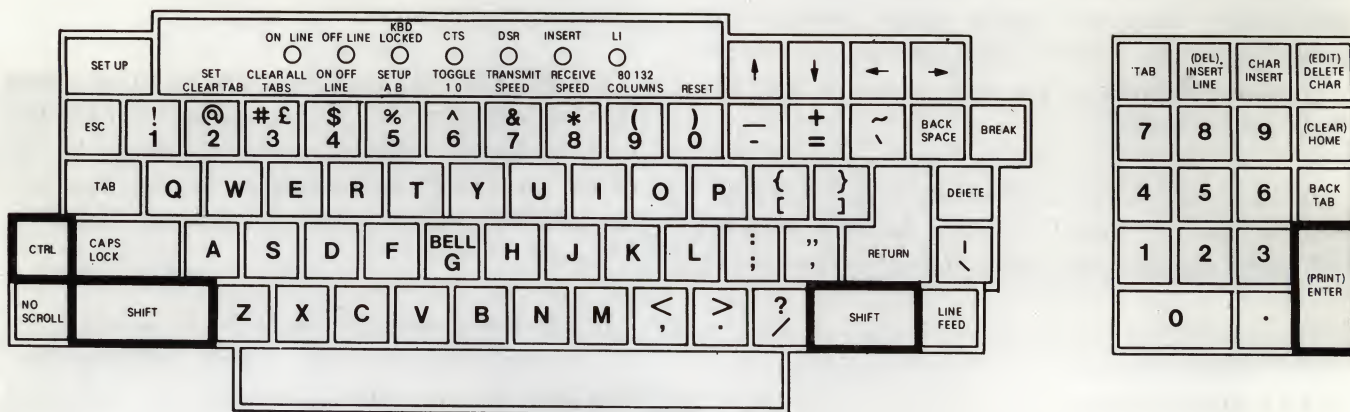


Figure 1-5 VA120 Printing Keys

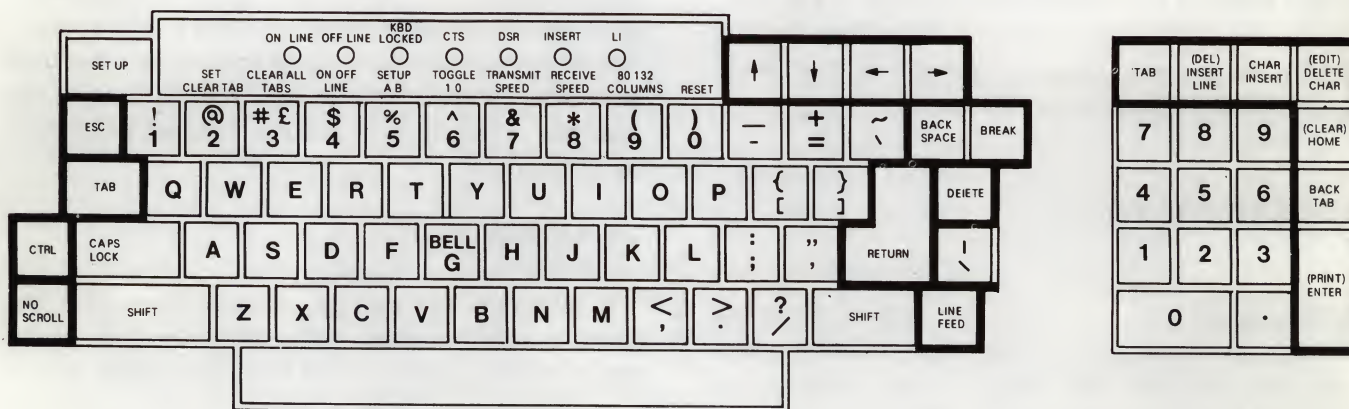


Figure 1-6 Editing Keys

NO SCROLL operates only in full duplex communication when **SET-UP** auto **XON/XOFF** feature is on.

← → ↑ ↓

The directional keys ← → ↑ ↓ move the cursor's position on the video screen, directing placement of the next character. The cursor will not cause scrolling and will not go beyond defined margins.

CTRL Key

CTRL key when pressed down, affects other keys on the keyboard, causing them to generate certain control characters. These are listed more specifically in Chapter 5. Note that when the terminal is used as an editor, the Xon and Xoff control characters will not be transmitted. Also, depending on what form of processing is used, the control characters may have several different effects. For more information about processing please refer to Chapter 7.

BACK SPACE Key

The **BACKSPACE** key moves the cursor one space to the left.

RETURN Key

The **RETURN** key moves the cursor back to the left margin of next line. Also, when the line transmit mode has been chosen (in **SET-UP**), the **RETURN** key may be used to begin transmission to the computer. For more information please refer to Chapter 4.

LINE FEED Key

The **LINE FEED** key moves the cursor down one line, and causes scrolling when in bottom margin.

DELETE Key

The **DELETE** key erases one character immediately to the left of the cursor. All characters on the line which are to the right of the cursor automatically move one space to the left, filling in the space.

TAB Key

There are two **TAB** keys, one on the main keyboard and one on the aux-keypad. They both move the cursor to either the next unprotected field, the next **TAB** position, or to the bottom margin, whichever of these three positions is encountered first.

(EDIT) DELETE CHAR Key

The **DELETE CHAR** key, erases the character on the cursor position and moves characters to the right of the cursor one space to the left, filling in the space automatically.

Used together with the **SHIFT** key, the **(EDIT)** key also functions as a selector to put the terminal into either the interactive or the editing mode. What mode is being used will be indicated on the keyboard.

(DEL) INSERT LINE Key

The **INSERT LINE** key will add one line of empty space where directed by the cursor. However, if there is protected field on current line, this key will not function.

When the **SHIFT** key is pressed, the **(DEL) LINE** key will erase the entire line at the cursor and will move all lines below the deleted line up. A new line of empty spaces is produced at the bottom of the screen. This key also will not function if the current line is in a protected field.

CHAR INSERT Key

The **CHAR INSERT** key, when pressed on, puts the terminal into the insert mode. When a character is inserted, it will move all characters to the right of the cursor on that line one space further to the right. The characters which are moved beyond the right margin will disappear. Characters shifted into a protected field will also disappear.

The replace mode is on when the insert mode is off. In this mode, new characters replace the characters to the right of the cursor.

(CLEAR) HOME Key

The **HOME** key moves the cursor to the first line and first column of the scrolling region.

When the **SHIFT** key has been pressed down, the **(CLEAR)** key will cause all characters not in protected fields to be erased and will move the cursor to the start of the first unprotected field.

BACK TAB Key

The **BACK TAB** key moves the cursor back to either the beginning of the current unprotected field, or to the previous unprotected field, or to the last TAB position, whichever is encountered first.

(PRINT) ENTER Key

The **ENTER** key causes the characters on the screen to be transmitted to the computer when the terminal is in the edit mode.

The **PRINT** key also works with the **CTRL** and **SHIFT** keys in printing using the serial printer.

The **BREAK** and **ESC** keys have no function in the editing mode.

2-5. SET-UP Keys

Keys that have special functions in the SET-UP mode are indicated in figure 1-7.

Chapter 4 has a more complete description of the uses and functions of SET-UP. Below is a brief description of the SET-UP keys and their general uses in SET-UP A, and SET-UP B, and SET-UP C features.

The **SET-UP** key puts the terminal into SET-UP. SET-UP features changes only when certain key has been pressed. While in SET-UP, many of the keyboard keys assume specific uses different from their uses in other modes.

@

2 , SET/CLEAR TAB, is used in SET-UP A to set or clear individual horizontal TABs in the terminal. This key is not used in SET-UP B or SET-UP C.

£

3 , CLEAR ALL TABS, is used in SET-UP A to clear all horizontal TAB stops that have been set previously. This key is not used in SET-UP B or SET-UP C.

\$

4 , ON/OFF LINE key, is used in any of the three SET-UP modes to turn on the ON-LINE or OFF-LINE while OFF-LINE keyboard entries are displayed on the screen but terminal can not receive or transmit characters. Switched to ON-LINE, the terminal can both receive and transmit.

%

5 , SET-UP A/B/C key, is used to select the SET-UP A, B, or C mode for the terminal.

Λ

6 , TOGGLE 1/0 key, will change a feature that is selected using the cursor. This key is used in SET-UP B and C, not in SET-UP A.

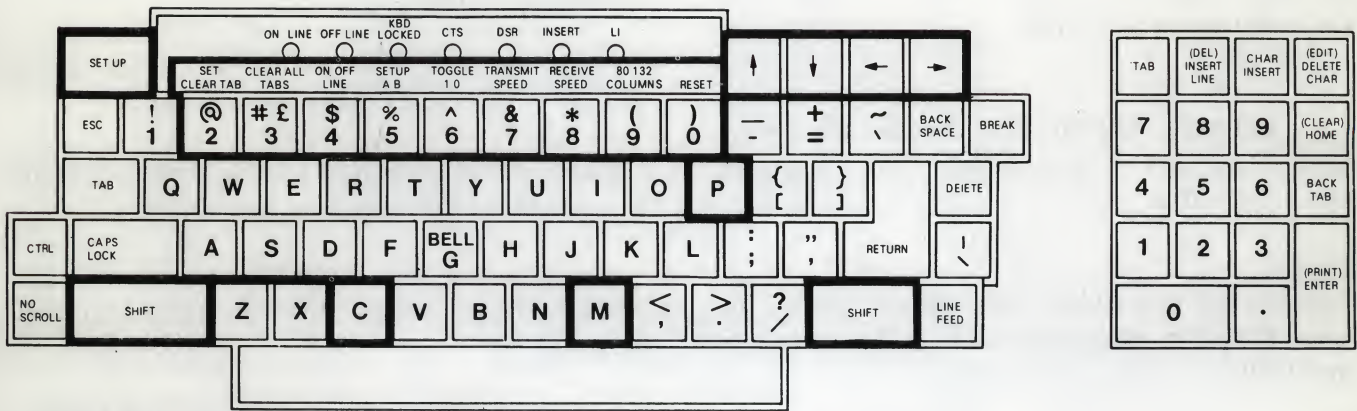


Figure 1-7 VA120 SET-UP Keys

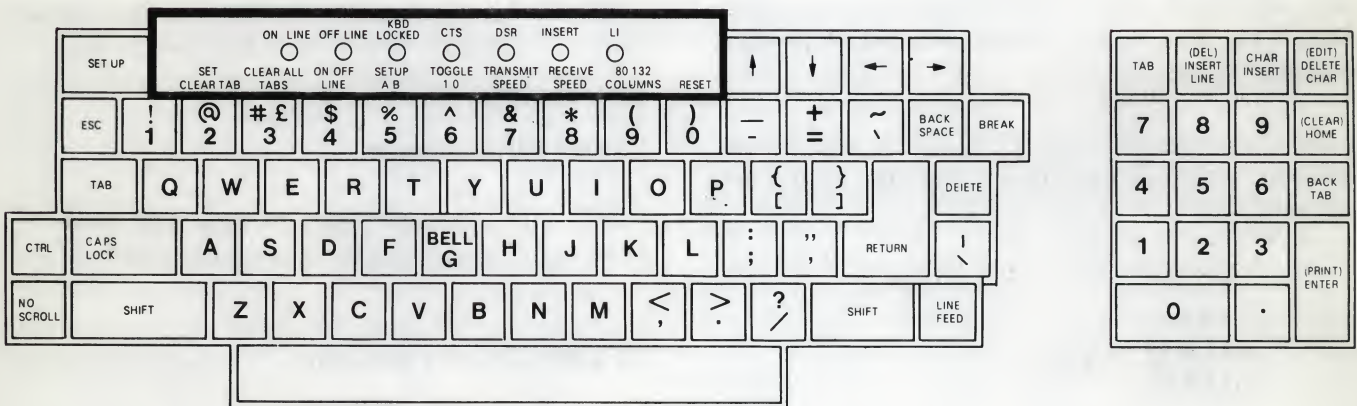


Figure 1-8 Keyboard Indicator

&

7 , TRANSMIT SPEED key, is used to change the transmit speed (baud rate) of the terminal. This key is used only in SET-UP B.

8 , RECEIVE SPEED key, changes the receive speed (baud rate) of the terminal. This key is used only in SET-UP B.

(

9 , 80/132 COLUMNS key, selects display of either 80 or 132 columns per line. It is used only in SET-UP A.

)

0 , RESET key, is used to trigger the reset sequence, which has the same result as turning off the AC power and then ON.

↑ ↓ keys control display brightness level.

← → keys control horizontal movement of the cursor. In SET-UP B when **SHIFT** key is pressed, modem interface can be selected after pressing **←** key, while **SHIFT** key plus **→** key permits selection of printing interface features.

The following keys are **FUNCTION** keys whose function is determined by the specific application software used:

ESC key
TAB key
BACK SPACE key
DELETE key

A key, pressed when **SHIFT** key is down in SET-UP B, identifying ANSWERBACK message.

C key, pressed when **SHIFT** key is down in SET-UP B, will after release of both keys generate a **TURNAROUND** character, used in half-duplex communication with code control turnaround (HDX B).

D key, pressed when **SHIFT** key is down in any SET-UP display, allows default features to be selected. Default features are described in Chapter 4.

M key, pressed when **SHIFT** key is down, will upon release of both keys allow selection of communication type (choice of five).

P key, pressed when **SHIFT** key is down, in SET-UP B, selects data/parity bits selection.

R key, pressed when **SHIFT** key is down in SET-UP B, recalls SET-UP features from user memory.

S key, pressed when **SHIFT** key is down in any SET-UP display, stores SET-UP features in user memory.

T key pressed when **SHIFT** key is down in SET-UP A, selects **TAB** Default SET-UP feature selections which clears all **TAB** stops and sets **TAB** stops in every eighth character position.

3. KEYBOARD INDICATORS (FIGURE 1-8)

3.1 On Line Indicator

ON LINE indicator lights to show communication is open to computer, also indicates power on.

3.2 OFF LINE Indicator

OFF LINE indicator lights to show that power is on but communication is not open to computer.

3.3 KBD LOCKED Indicator

KBD LOCKED indicator lights to show that keyboard is locked. A keyboard locked condition means the keyboard character buffer is full and unable to accept character from keyboard. When **KBD LOCKED** is on, keyboard entries are lost.

The terminal can receive characters from computer. In SET-UP keyclick condition, keyclicks are not generated until the keyboard is cleared.

While the **KBD LOCKED** indicator is on, entering and exiting SET-UP erases the characters in the buffer,

cancels printing, print operation requests and character transmission in editing mode.

The keyboard may be locked under the following conditions:

- (1) There is no proper connection between the terminal and the computer, correct communication line signals are not being received.

To clear: When the terminal is connected properly to the computer, the KBD LOCKED will be cleared. (see CTS and DSR indicator to check the connection.)

- (2) The terminal is receiving characters in half duplex communication and cannot transmit.

To clear: The KBD LOCKED will be cleared when the line is turned around.

- (3) Characters are typed into the terminal faster than they are transmitted.

To clear: KBD LOCKED is cleared, when terminal transmits the characters in buffer to computer.

- (4) Transmission of characters taking place in EDIT mode.

To clear: KBD LOCKED is cleared when character transmission is completed or cancelled.

- (5) Print operation is selected while terminal is off line.

To clear: KBD LOCKED is cleared when the print operation completed or cancelled.

- (6) The keyboard has been turned off by the computer.

To clear: The keyboard can be cleared by the computer.

3.4 CTS Indicator

CTS indicator shows the on and off condition of clear to send or secondary clear to send modem connector signals. CTS is not used when 20 mA current

loop is used.

3.5 DSR Indicator

DSR indicator lights to show that data set ready modem connector signal is on, the data set connected to the terminal is ready to transmit and receive characters, when light is off, all interface signals to the VA 120 terminal should be ignored. DSR is not used when 20 mA Loop is used.

3.6 Insert Indicator

INSERT indicator lights to show that insert or replace mode has been selected by computer or by INSERT CHAR key in edit mode. Insert function has been described under CHAR INSERT key.

4. AUDIBLE INDICATORS

A keyclick is generated by pressing all keys except SHIFT and CTRL unless the keyboard is locked or the SET-UP keyclick feature is off. When the keyboard is locked, keyboard entries are lost.

A bell tone is generated when the cursor is eight characters from the right margin (if the SET-UP margin feature is on). A bell tone is also generated when an error is typed in EDIT mode, or when the computer bell character is received.

Chapter 2 Printing

I. GENERAL

An optional serial printer can be connected to the VA 120 terminal. There are four print operations:

Auto print (line at a time) — selectable through computer or VA 120

Print screen — selectable through computer or VA 120 terminal

Printer controller — selectable through computer only

Print cursor line — selectable through computer only

1. AUTO PRINT (LINE AT A TIME)

AUTO PRINT is used to print the current line of characters as the cursor departs the line. It does not function in EDIT mode. Cursor moves to the next line when Line Feed, Form Feed or Vertical TAB characters is received. In AUTO WRAP feature, characters received when cursor is at the right margin are wrapped to the next line.

In all cases, printing double height or double width characters does not alter size of characters. Normal size characters are printed twice.

2. PRINT SCREEN

Prints entire scrolling region or complete screen depending on print extent SET-UP feature selection.

3. PRINTER CONTROLLER

Provides computer with direct control on the printer, characters received from computer are printed, without

display on the screen. If, while in printer controller, print screen is selected, screen display will be printed immediately.

4. PRINT CURSOR LINE

Prints cursor line without moving cursor. To cancel the print cursor line, enter SET-UP and exit SET-UP.

II. PRINTING OPERATIONS

To turn on AUTO PRINT:

Press CTRL key and hold.
Press PRINT key.
Release both keys.

To stop PRINTING A LINE (without turning off auto print):

Enter SET-UP.
And exit SET-UP.

When resuming printing after interruption by SET-UP:
Move printhead to left-hand margin.

To stop AUTO PRINT:

Press CTRL key and hold.
Press PRINT key.
Release both keys.

To select PRINT SCREEN:

Press SHIFT key and hold.
Press PRINT key.
Release both keys.

To stop PRINT SCREEN before printing is complete:
Enter SET-UP.
And exit SET-UP.

Chapter 3 Editing

I. GENERAL:

To enter EDITING mode:
Press **SHIFT** key and hold.
Press **EDIT** key.
Release both keys.

EDIT keyboard indicator will light. If EDIT in-

dicator is off, computer is in interactive mode.

Operations in the **EDITING** mode are all performed at the cursor position within the defined margins. Scrolling is not permitted when the last position of the scrolling region is entered by a character or line feed. Editing mode permits correction and alteration before character is transmitted to computer.

II. EDITING OPERATIONS

| OPERATION | PROCEDURE | EFFECT |
|-----------------------------|---|---|
| CHARACTER PROTECTION | SET-UP or by computer | Creates protected field on screen. Characters typed into protected field will either be placed in first available position in next unprotected field or, if no unprotected field remains, will be disregarded, indicated by moving cursor to bottom right margin and bell tone. |
| MOVING CURSOR | Press TAB , BACK TAB , (CLR)/HOME , or CURSOR CONTROL keys | Cursor moves according to function key as described in Chapter 2. |
| INSERTING LINE | 1. Move cursor to position where additional line is desired. 2. Press INSERT LINE key. The line selected cannot be in protected field. | Lines from cursor position downwards will shift one line down. New line has same character attributes as the line it displaces; cursor moves to new line left margin. If inserting a line moves an existing line into a line with protected field, or into the bottom margin, the line moved is lost and will not be transmitted to computer. |
| INSERTING CHARACTER | 1. Move cursor to the position where additional | Keyboard insert indicator lights to show insert function ready. After character is typed, other |

character is desired.

2. Press **CHAR INSERT** key.

3. Type characters desired.
Press **CHARACTER INSERT** key again to put terminal back into replace mode.

DELETING LINE

1. Move cursor line to be deleted.
2. Press **DEL LINE** key.

DELETING CHARACTER (using DEL CHAR key)

1. Put cursor on the character to be deleted.
2. Press **DEL CHAR** key on auxiliary keypad.

DELETING CHARACTER (using DELETE key)

1. Move cursor to position one space to the right of character to be deleted.
2. Press **DELETE** key

CLEARING THE SCREEN

1. HOLD down **SHIFT** key
2. Press **CLEAR** key.
3. Then release both keys.

TRANSMITTING EDITED CHARACTERS (in line transmit

Press **ENTER** key or **RETURN** key while in line transmit mode.

characters on the line to right of cursor move one space to the right. Cursor will not insert into protected field and will move automatically to next unprotected field. Characters moved into protected field or out side margins are lost.

Selected line disappears from screen. Lines below it are moved up one line to fill deleted line. At bottom of screen one line of empty spaces is added for each deleted line. This line has same characters attributes as line immediately above it. Lines in protected fields cannot be deleted.

Characters on the line to right of cursor move one space to the left. Cursor remains in same position. One empty space is added at right margin or at right end before next protected field. If cursor is inside protected field when **DEL CHAR** key is pressed, bell sounds and no character is deleted, cursor will automatically move to the following unprotected field.

The character immediately to the left of the cursor is deleted. If the cursor is at the first column of a line, pressing the **DELETE** key will move the cursor to the last column of the previous line and delete the character. If the cursor is at a left-hand margin or at the right side of a protected field, the last character on the line or the last character of the nearest preceding unprotected field will be deleted. If the **DELETE** key is pressed when the cursor is at the top line of the scrolling region at the HOME position, the key has no effect.

All unprotected fields on the screen are deleted. Cursor will then move to the start of first unprotected field.

When key is pressed, keyboard locks until characters has been transmitted. KBD LOCKED indicator lights. The edited characters are transmitted as a block to computer. While ON LINE,

mode)

Transmitting edited
characters (in
transmit termination
mode)

To clear KBD
LOCKED or
Transmission

Press **ENTER** key to
transmit character blocks.

Enter **SET-UP** and
exit **SET-UP**

cursor moves to the first column of current
line or next line, depending on **SET-UP LINE
FEED/NEW LINE SET-UP** status.

Keyboard locks and indicator lights until trans-
mission completed. Cursor does not move
on screen.

All transmissions are stopped and requested
transmissions are cancelled, keyboard locked
condition is cleared.

Chapter 4 Set-Up Operation

I. GENERAL

Through SET-UP commands from the terminal, SET-UP features of the computer's operating and user memories can be recalled, changed or erased. The computer's default memory can be recalled but

not changed.

The SET-UP features selections stored in any of these memories are viewed in the three SET-UP Displays pictured in figure 4-1.

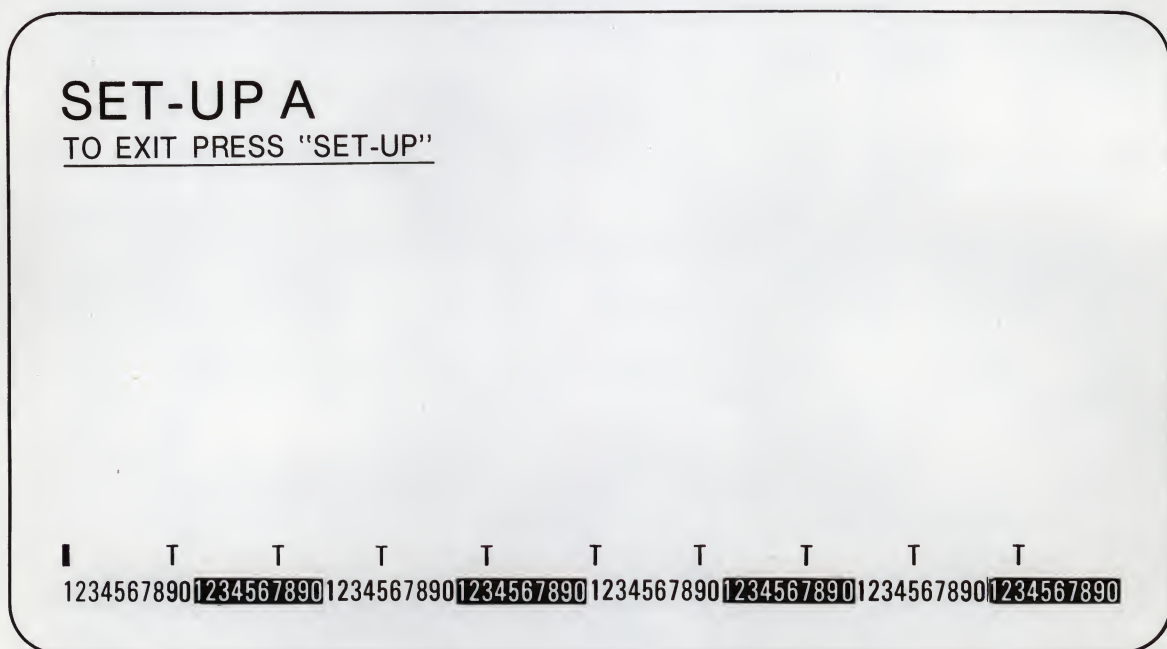


Figure 4-1 SET-UP Displays (Sheet 1 of 3)

SET-UP B

TO EXIT PRESS "SET-UP"

V1.1

MODEM

PRINTER

P=7S T=9600 R=9600 FDX A

P=7S T/R=300

1 1101 2 0111 3 0000 4 1101 5 1010 6 1000 7 0010

Figure 4-1 SET-UP Displays (Sheet 2 of 3)

SET-UP C

TO EXIT PRESS "SET-UP"

A 0110 B 0111 C 0000 D 0000

Figure 4-1 SET-UP Displays (Sheet 3 of 3)

SET-UP A displays TAB stop locations and column numbers of screen display.

SET-UP B displays most operating feature selections, including modem and printer interface selections.

SET-UP C displays editing feature selections.

To cancel print operation or edit mode transmission, enter **SET-UP**. If keyboard is locked, characters in keyboard buffer are erased before transmitting to computer. KBD LOCKED indicator then turns off.

II. SET-UP MEMORY PROCEDURES

There are three (3) SET-UP feature memories: Operating (temporary), user, and default memory (Figure 4-2, 4-3).

1. OPERATING MEMORY

All three computer memories can be reached through SET-UP. In order to enter SET-UP, press SET-UP key. SET-UP A will be displayed. SET-UP B and SET-UP C can be selected using **SET-UP A/B/C** key. These display the SET-UP features currently in the operating memory. To exit SET-UP, press **SET-UP** key again. The operating memory determines how VA120 operates.

To change SET-UP features in operating memory:

- (1) Enter **SET-UP**
- (2) Choose Display SET-UP A/B/C required
- (3) Change features as desired
- (4) Exit **SET-UP**

2. USER MEMORY

SET-UP features in this memory are stored by the keyboard. They cannot be changed by computer. To move SET-UP features between operating memory and user memory, use Store, Recall and Reset. The previous features in operating memory are erased.

2.1 Recall

To recall the features from user memory into operating memory, the previous features in operating memory are erased.

- (1) Enter **SET-UP**
- (2) Hold **SHIFT** key down, press R key, then release both keys.
- (3) Exit **SET-UP**

After recalling from user memory, SET-UP A will be displayed. Note that at this time the terminal has disconnected the communication line to the computer and all input and keyboard character buffers are lost.

2.2 Store

To store the operating memory SET-UP feature selections into user memory

- (1) Enter **SET-UP**
- (2) Hold **SHIFT** key down, press S key and release both keys.
- (3) Exit **SET-UP**

Storing is entered from terminal instead of from computer. Then SET-UP A will again be displayed.

2.3. Reset

To reset
User memory:

- (1) Enter **SET-UP**
- (2) Press **RESET** key

The terminal responds to Reset by

- (1) Disconnecting from the communication line.
- (2) Running a self-test.
- (3) Then the terminal recalls SET-UP features from the user memory. These replace the SET-UP features that were currently in the operating memory.
- (4) Input and keyboard character buffers are erased.
- (5) After the reset operation, causing the screen to be cleared of all characters, SET-UP is exited automatically.

3. DEFAULT MEMORY

Default SET-UP feature are typical feature selections used by the terminal. The default selection cannot be changed. There are two types of default: general default and TAB default.

When the terminal cannot read user memory, or default is selected from keyboard, default occurs.

3.1. General Default

When general default is selected, all SET-UP features in operating memory are changed to default features.

In SET-UP A: 80 column, 8th column TAB stop

In SET-UP B: Refer to Figure 4-2

In SET-UP C: Refer to Figure 4-3

The terminal is off-line and answerback message as erased.

To select general default, use following procedures:

- (1) Enter **SET-UP**
- (2) Press **D**
- (3) Press **SET-UP** to exit **SET-UP**

When general default is selected, terminal will be disconnected from communication. Input and keyboard character buffers are erased. Screen will display SET-UP A.

Characters displayed on the screen are lost when SET-UP is entered.

3.2. TAB Default

When TAB default is selected, new TAB stop is set at every 8th column.

To select TAB default:

- (1) Enter **SET-UP**
- (2) Hold **SHIFT** and Press **T**
- (3) Press **SET-UP** to exit SET-UP

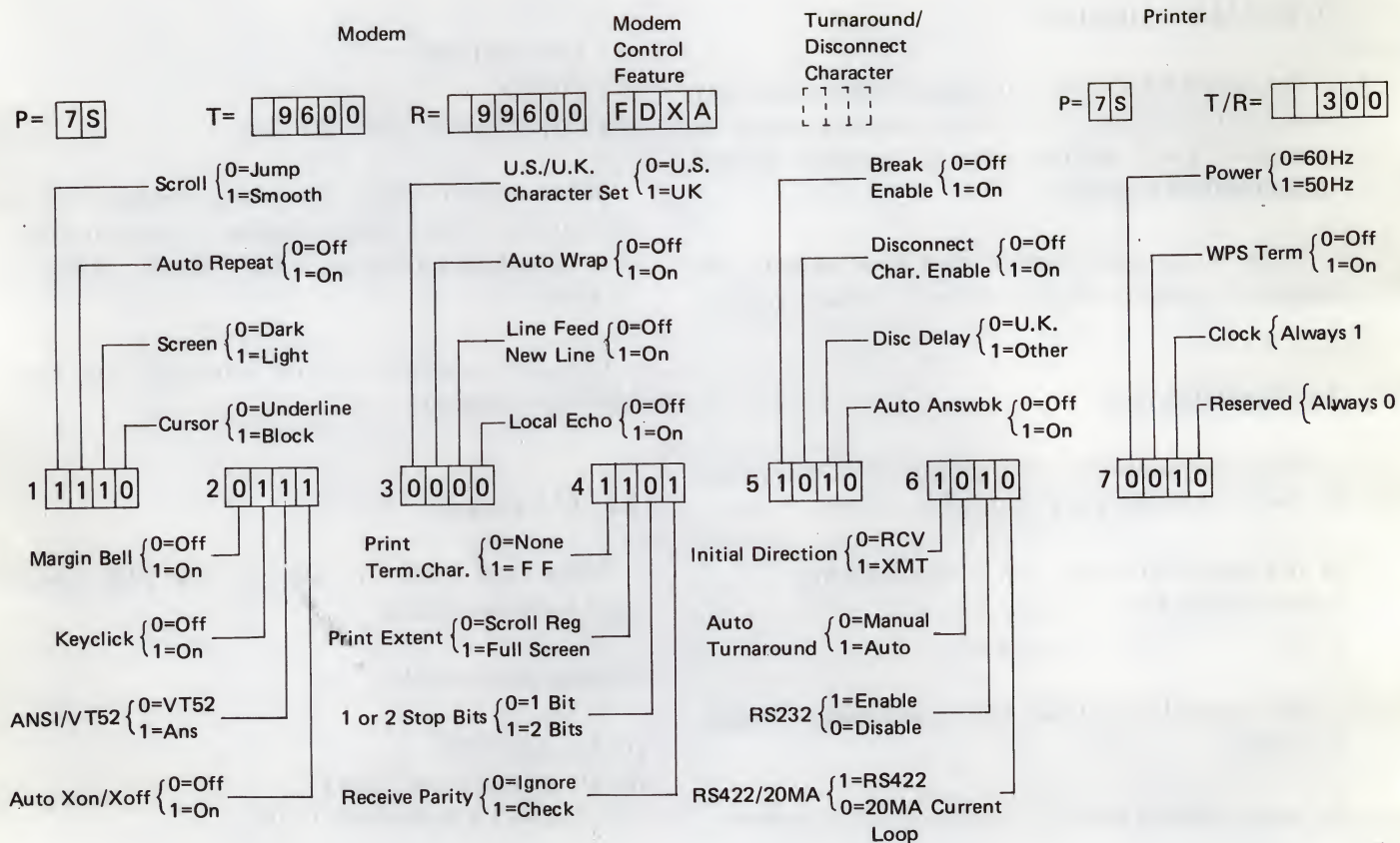


Figure 4-2 SET-UP B Default Feature Selections

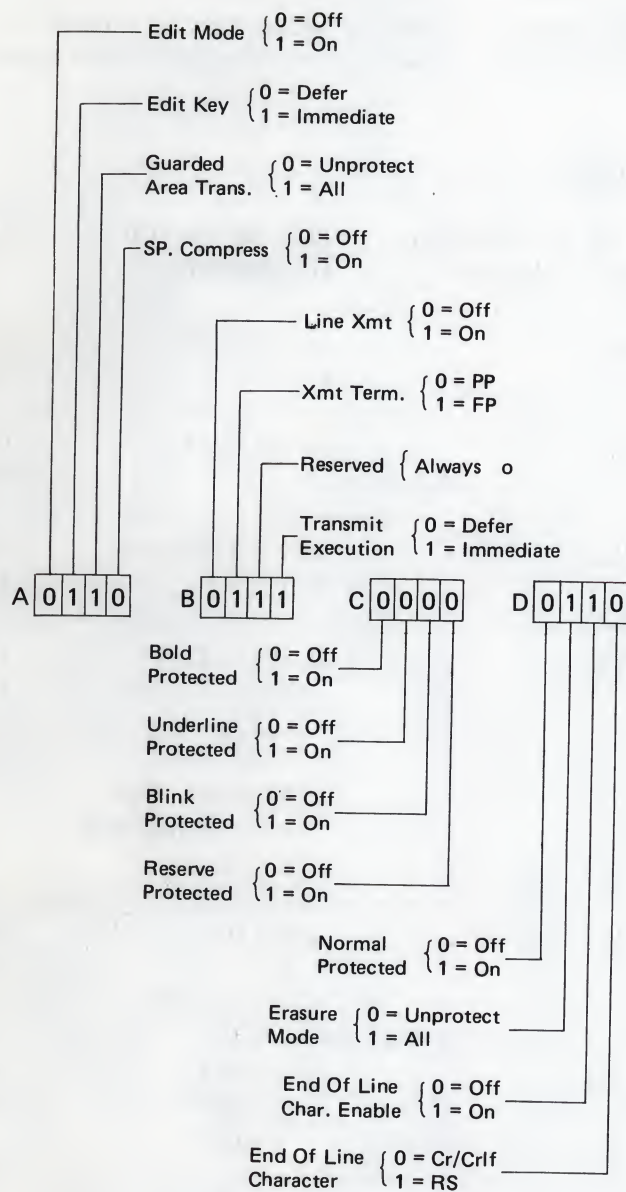


Figure 4-3 SET-UP C Default Feature Selections

III. SET-UP OPERATION

Following is a general table of SET-UP features of the VA 120 terminal. Each feature is listed with

its SET-UP display (A,B or C), operating key or switch, feature type (see Table 4-1) and whether or not it can be controlled by the computer.

TABLE 4-1: VA 120 SET-UP FEATURES

| FEATURE | CHANGED IN SET-UP A/B/C | CAN BE CHANGED BY COMPUTER | KEY OR SWITCH TO OPERATE | FEATURE TYPE |
|----------------------|----------------------------|-------------------------------|--|--------------------------------|
| ON/OFF LINE | A/B/C | No | ON/OFF LINE KEY | Communication Compatibility |
| SCREEN BRIGHTNESS | A/B/C | No | ↑AND↓KEYS | Operator Preference |
| COLUMNS PER LINE | A | Yes | 80/132 COLUMNS KEY | Communication Compatibility |
| TAB STOPS | A | Yes | 1. SET/CLEAR TAB KEY OR CLEAR ALL TABS KEY. 2. RETURN, TAB AND SPACE BAR KEYS. | Communication Compatibility |
| SCROLL | B | Yes | SWITCH 1-1 0 = JUMP 1 = SMOOTH | Communication Compatibility |
| AUTO REPEAT | B | Yes | SWITCH 1-2 0 = OFF 1 = ON | Operator Preference |
| SCREEN BACKGROUND | B | Yes | SWITCH 1-3 0 = DARK 1 = LIGHT | Operator Preference |
| CURSOR | B | No | SWITCH 1-4 0 = UNDERLINE 1 = BLOCK | Operator Preference |
| MARGIN BELL | B | No | SWITCH 2-1 0 = OFF 1 = ON | Operator Preference |

| FEATURE | CHANGED IN SET-UP A/B/C | CAN BE CHANGED BY COMPUTER | KEY OR SWITCH TO OPERATE | FEATURE TYPE |
|-----------------------------------|----------------------------|-------------------------------|---|--------------------------------|
| KEYCLICK | B | No | SWITCH 2-2 0 = OFF 1 = ON | Operator Preference |
| ANSI/VT52 | B | Yes | SWITCH 2-3 0 = VT52 1 = ANSI | Communication |
| AUTO XON/XOFF (FDX) | B | No | SWITCH 2-4 0 = OFF 1 = ON | Communication Compatibility |
| U.S./U.K. CHARACTER SET | B | Yes | SWITCH 3-1 0 = # 1 = £ | Communication Compatibility |
| AUTO WRAP | B | Yes | SWITCH 3-2 0 = OFF 1 = ON | Communication Compatibility |
| LINE FEED/ NEW LINE | B | Yes | SWITCH 3-3 0 = OFF 1 = ON | Communication Compatibility |
| LOCAL ECHO | B | Yes | SWITCH 3-4 0 = OFF 1 = ON | Communication Compatibility |
| PRINT TERMINATION CHARACTER | B | Yes | SWITCH 4-1 0 = NONE 1 = FORM FEED | Communication Compatibility |
| PRINT EXTENT | B | Yes | SWITCH 4-2 0 = SCROLL REG 1 = FULL SCREEN | Communication Compatibility |
| 1 OR 2 STOP BITS | B | No | SWITCH 4-3 0 = 1 STOP BIT 1 = 2 STOP BITS | Communication Compatibility |
| BREAK ENABLE | B | No | SWITCH 5-1 0 = OFF 1 = ON | Communication Compatibility |

| FEATURE | CHANGED IN SET-UP A/B/C | CAN BE CHANGED BY COMPUTER | KEY OR SWITCH TO OPERATE | FEATURE TYPE |
|-----------------------------------|----------------------------|-------------------------------|---|--------------------------------|
| DISCONNECT CHARACTER ENABLE | B | No | SWITCH 5-2 0 = OFF 1 = ON | Communication Compatibility |
| DISCONNECT DELAY (FDX) | B | No | SWITCH 5-3 0 = U.K. 1 = OTHER | Communication Compatibility |
| AUTO ANSWERBACK | B | No | SWITCH 5-4 0 = OFF 1 = ON | Communication Compatibility |
| INITIAL DIRECTION (HDX) | B | No | SWITCH 6-1 0 = RCV 1 = XMIT | Communication Compatibility |
| AUTO TURNAROUND (HDX) | B | No | SWITCH 6-2 0 = MANUAL 1 = AUTO | Communication Compatibility |
| RS232 | B | No | SWITCH 6-3 0 : RS232 DISABLE 1 : RS232 ENABLE | Operator Preference |
| CURRENT LOOP/ RS422 | B | No | SWITCH 6-4 0 : CURRENT LOOP 1 : RS422 | Operator Preference |
| POWER | B | No | SWITCH 7-1 0 = 60 HZ 1 = 50 HZ | Installation |
| WPS TERMINAL | B | No | SWITCH 7-2 0 = OFF 1 = ON | Installation |
| CLOCK | B | No | SWITCH 7-3 ALWAYS 1 | Installation |
| RESERVED | B | | SWITCH 7-4 ALWAYS 0 | |
| MODEM DATA/ PARITY BITS | B | No | P KEY | Communication Compatibility |

| FEATURE | CHANGED IN SET-UP A/B/C | CAN BE CHANGED BY COMPUTER | KEY OR SWITCH TO OPERATE | FEATURE TYPE |
|---|----------------------------|-------------------------------|---|--------------------------------|
| TRANSMIT SPEED | B | No | TRANSMIT SPEED KEY | Communication Compatibility |
| RECEIVE SPEED | B | No | RECEIVE SPEED KEY | Communication Compatibility |
| MODEM CONTROL | B | No | M KEY | Communication Compatibility |
| TURNAROUND (END OF CHARACTER BLOCK/DISCONNECT CHARACTER) | B | Yes | C KEY | Communication Compatibility |
| PRINTER DATA/ PARITY BITS | B | No | P KEY | Communication Compatibility |
| PRINTER RECEIVE/TRANSMIT SPEED | B | No | EITHER TRANSMIT OR RECEIVE SPEED KEY | Communication Compatibility |
| ANSWERBACK | B | No | A KEY | Communication Compatibility |
| EDIT MODE | C | Yes | SWITCH A-1 0 = OFF 1 = ON | Editing |
| EDIT KEY | C | Yes | SWITCH A-2 0 = DEFERRED 1 = IMMEDIATE | Editing |
| GUARDED AREA TRANSFER | C | Yes | SWITCH A-3 0 = UNPROTECTED 1 = ALL | Editing |
| SPACE COMPRESSION | C | Yes | SWITCH A-4 0 = OFF 1 = ON | Editing |
| LINE TRANSMIT | C | Yes | SWITCH B-1 0 = OFF 1 = ON | Editing |

| FEATURE | CHANGED IN SET-UP A/B/C | CAN BE CHANGED BY COMPUTER | KEY OR SWITCH TO OPERATE | FEATURE TYPE |
|--------------------------|----------------------------|-------------------------------|---|--------------|
| TRANSMIT TERMINATION | C | Yes | SWITCH B-2 0 = PARTIAL PAGE 1 = FULL PAGE | Editing |
| RESERVED | C | | SWITCH B-3 UNCHANGEABLE FROM 0 | Editing |
| TRANSMIT EXECUTION | C | Yes | SWITCH B-4 0 = DEFERRED 1 = IMMEDIATE | Editing |
| BOLD PROTECTED | C | Yes | SWITCH C-1 0 = OFF 1 = ON | Editing |
| UNDERLINE PROTECTED | C | Yes | SWITCH C-2 0 = OFF 1 = ON | Editing |
| BLINK PROTECTED | C | Yes | SWITCH C-3 0 = OFF 1 = ON | Editing |
| REVERSE PROTECTED | C | Yes | SWITCH C-4 0 = OFF 1 = ON | Editing |
| NORMAL PROTECTED | C | Yes | SWITCH D-1 0 = OFF 1 = ON | Editing |
| ERASURE MODE | C | Yes | SWITCH D-2 0 = UNPROTECTED 1 = ALL | Editing |
| END OF LINE ENABLE | C | No | SWITCH D-3 0 = OFF 1 = ON | Editing |
| END OF LINE CHARACTER | C | No | SWITCH D-4 0 = CR/CRLF 1 = RS | Editing |

1. GENERAL SET-UP A/B/C PROCEDURE

1.1 SET-UP A PROCEDURES

Features of SET-UP A will be explained in detail below. In order to use these features, a process is followed by pressing specific key for each feature (these keys are listed in the Table 4-1.) The procedure for operating in SET-UP is as follows:

- STEP 1 Enter SET-UP by pressing **SET-UP** key. Screen shows SET-UP A display.
- STEP 2 Press key designated for desired change.
- STEP 3 Exit SET-UP by pressing **SET-UP**. or, press **SET-UP A/B/C** key to enter SET-UP B or SET-UP C.

1.2 SET-UP B Procedures

Most SET-UP B features are selected using the following procedure:

- STEP 1 Enter SET-UP by pressing **SET-UP** key.
- STEP 2 Enter SET-UP B by pressing **SET-UP A/B/C** key and screen shows SET-UP B display.
- STEP 3 Move cursor using directional keys **←** , **→** , **RETURN**, **TAB**, and, **SPACE BAR** keys. Place cursor over switch to be changed.
- STEP 4 Use toggle 1/0 key to put switch into either 1 or 0 status.
- STEP 5 Exit SET-UP by pressing **SET-UP** key. Or, press **SET-UP A/B/C** key to enter SET-UP C.

Some features displayed in SET-UP B follow a different procedure. These features are: modem data/parity bits, modem transmit speed, modem receive speed, modem control and turnaround (end of character block)/disconnect character, printer data/parity bits and printer receive/transmit speed. The procedure for changing these features is as follows:

- STEP 1 Enter SET-UP by pressing **SET-UP** key.
- STEP 2 Enter SET-UP B by pressing **SET-UP A/B/C** key. Screen shows SET-UP B display.
- STEP 3 If modem features are not selected, press **SHIFT** key and hold. Press **←** key (for modem) or **→** key (for printer), then release both keys. Modem (or printer) features are displayed on a reverse video.

- STEP 4** Press the key (s) designated for each feature as follows:
- Modem Data/Parity Bits — **SHIFT + P** Keys
 - Modem Transmit Speed — **Transmit Speed** Key
 - Modem Receive Speed — **Receive Speed** Key
 - Modem Control — **SHIFT + M** Keys
 - Turnaround/
Disconnect Character — **SHIFT + C** Keys
 - Printer Data/Parity Bits — **SHIFT + P** Keys
 - Printer Receive/Transmit Speed — **Transmit or Receive Speed** Key

Then release both keys. Each time this is done, the modem (or printer) feature will display a new selection.

- STEP 5** Exit **SET-UP** by pressing **SET-UP** key. Or, press **SET-UP A/B/C** key to enter **SET-UP C**.

The **ANSWERBACK** feature, also controlled by **SET-UP B**, has a different procedure. To enter the answerback identification code into the computer:

- STEP 1** Enter **SET-UP** by pressing **SET-UP** key.
- STEP 2** Enter **SET-UP B** by pressing **SET-UP A/B/C** key.
- STEP 3** Press **SHIFT** key and hold. Then press **A** key, then release both keys. The screen will display **A =** (Figure 4-4)
- STEP 4** Type a message delimiter character (which can be any character not used in the answerback message).
- STEP 5** Enter the answerback message (which can include up to 20 characters). If control codes are typed they will be displayed as (◇) characters. Mistakes in typing can be corrected by typing the delimiter character, and go back to step 3.
- STEP 6** After you type the delimiter character, the answerback message will be entered into operating memory and transmit to the computer. If there are 20 characters in the message this will occur automatically. The answerback message may be retained in user memory by performing a **STORE** operation.
- STEP 7** Exit **SET-UP** by pressing **SET-UP** key, or enter **SET-UP C** by pressing **SET-UP A/B/C** key.

1.3 SET-UP C Procedures

Features of **SET-UP C** are explained in detail below. To use these features, make use of switches operated in the **SET-UP C** display (see Figure 4-12) which are listed in the Table 4-1, the procedures for operating in **SET-UP C** is as follows:

- STEP 1 Enter SET-UP by pressing **SET-UP** key.
- STEP 2 Press **SET-UP A/B/C** key. Screen will display SET-UP B. Press **SET-UP A/B/C** key again. Screen then displays SET-UP C.
- STEP 3 Move cursor using directional keys ← and →, **RETURN**, **TAB**, and **SPACE BAR** keys.
- STEP 4 Use toggle 1/0 key to put the switch into 1 or 0 status.
- STEP 5 Exit SET-UP by pressing SET-UP key. Or enter SET-UP A by pressing **SET-UP A/B/C** key.

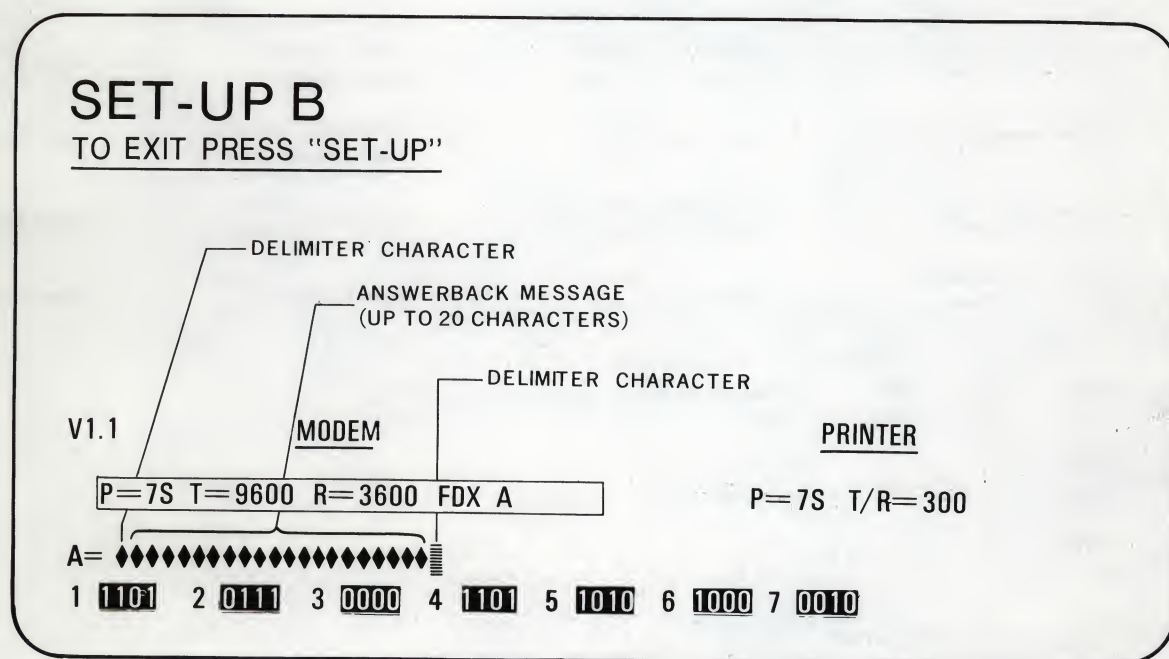


Figure 4-4 Answerback Message Summary

2. SET-UP FEATURES — DESCRIPTION

Figure 4-5 & 4-6 shows SET-UP B & C summary. respectively. Detailed descriptions are stated in section 2-1 to 2-4.

Figure 4-5 SET-UP B Summary

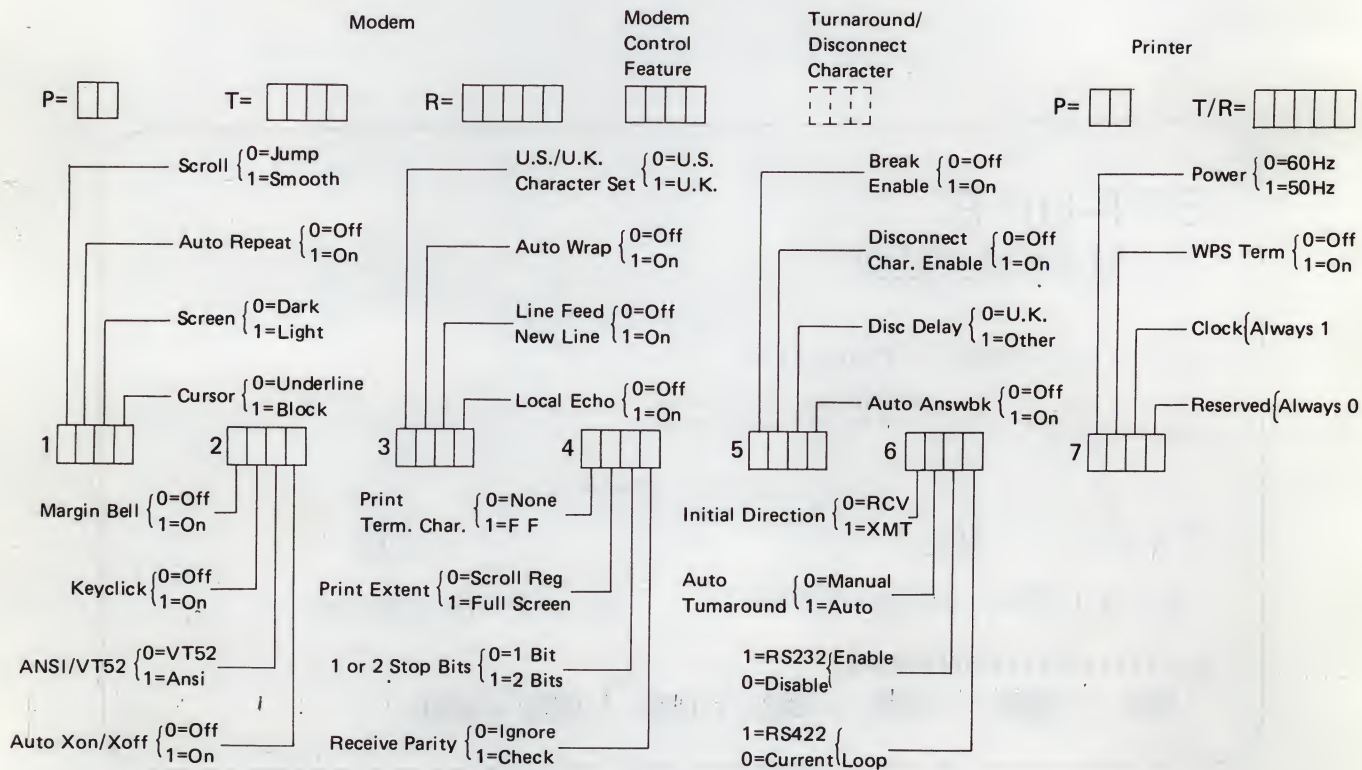


Figure 4-5 SET-UP B Summary

2.1 SET-UP A/B/C Features

ON/OFF LINE

This feature may be adjusted in SET-UP A,B, or C. On LINE operation is indicated when the ON-LINE keyboard indicator is on. When online, the terminal transmits and receives information from the computer. When off-line, the off line indicator is on, and communication is stopped with the computer. Any characters entered into the computer are displayed on the screen but not transmitted to the computer.

Note: When SET-UP DISCONNECT CHARACTER ENABLE feature is on, a long break disconnect must be performed before going OFF LINE. Please see Chapter 7.

SCREEN BRIGHTNESS

Brightness of the screen display is increased by the ↑ key and decreased by the ↓ key in SET-UP A, B, or C.

2.2. SET-UP A Feature

TAB STOPS

The SET-UP A display indicates TAB stops with T characters at the bottom of the screen. In SET-UP A feature TAB stops may be changed one at a time, or they may be all cleared at once. To erase them one at a time, use the **SET/CLEAR TAB** key to delete the tab at cursor position; to clear all existing tabs, use the **CLEAR-ALL TABS** key. They are set one by one using the cursor to direct their placement. TAB default sets one tab stops at every 8th column. When you print characters, the computer ignores terminal and printer tab stops. But, when in **PRINTER CONTROLLER** operation, the tabs must be selected to match the computer.

80/132 COLUMNS

This feature selects either 80 or 132 columns per line.

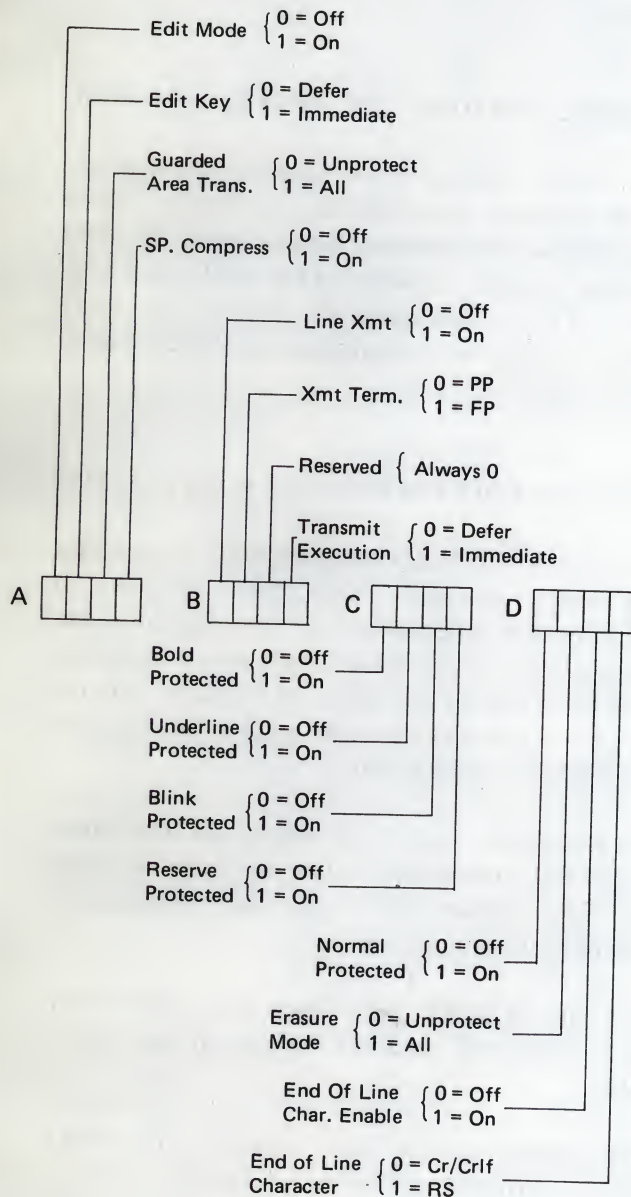


Figure 4-6 SET-UP C Summary

2.3. SET-UP B Features

SCROLL (SWITCH 1-1: 0=JUMP, 1=SMOOTH)

Scrolling is the upward or downward movement of lines on the screen making room for new lines. Jump scroll moves new lines as fast as they are received. Smooth scrolling moves the lines at fixed rate for easy reading (a maximum of six lines per second.). Jump scroll is the preferred method for half or full duplex communication without support of **XON/XOFF**.

AUTO REPEAT (SWITCH 1-2: 0=OFF, 1=ON)

When on, this feature causes a key to generate its character repeatedly at a rate of 30 characters per second, when the key is depressed for more than one half second. All keys can auto-repeat except for the **SET-UP, ESC, CTRL, NO SCROLL, RETURN** and **ENTER** keys. If this feature is off, each key will generate its character only once per depression.

SCREEN BACKGROUND (SWITCH 1-3: 0=DARK, 1=LIGHT)

With dark background, the screen shows light characters on a dark background. With light background, it shows dark characters on a light background. Select the key for the background desired.

CURSOR SELECTION (SWITCH 1-4: 0=UNDERLINE, 1=BLOCK)

The cursor may appear on the screen in either of two ways; an underline (—) or a block (■).

MARGIN BELL (SWITCH 2-1: 0=OFF, 1=ON)

If 'ON', this feature causes a bell to be sounded when the cursor is eight spaces from the end of a line. When off, no bell will sound.

KEYCLICK (SWITCH 2-2: 0=OFF, 1=ON)

When on, a keyclick sound is generated each time a key is pressed (except **SHIFT** and **CTRL** keys). When off, click sounds are not generated. Keyclicks are also not generated when the keyboard is in locked condition.

ANSI/VT52 (SWITCH 2-3: 0=VT52, 1=ANSI)

This feature controls the terminal's selection of one of two different programming standards: **ANSI** (American National Standards Institute) which functions according to ANSI standards x3.41-1974 and x3.64-1979; or **VT52**, which makes the terminal compatible with previous Digital software using the VT52 terminal. See Chapter 6.

AUTO XON/XOFF (SWITCH 2-4: 0=OFF, 1=ON)

When on, in full duplex communication, the terminal automatically generates **XON/XOFF** characters to make sure that data transmitted from the host computer is not lost. If this feature is not activated, characters received may be lost when the character buffer is full. When characters are lost a substitute character (■) is displayed on the screen.

To prevent the loss of characters, use this feature (ON) to halt transmission when the buffer is nearly full. Transmission will begin again automatically when the buffer is almost empty.

The **NO SCROLL** key, which uses **XON/XOFF** control characters, does not function if this feature is off.

The printer interface mode reacts to **XON/XOFF** characters no matter this feature is on or off.

U.S./U.K. CHARACTER SET (SWITCH 3-1: 0=#, 1=£POUND SIGN)

There is only one character difference between the two sets: In United States character set, a # character is produced by the upper case of the key 3. In the United Kingdom set, this character is a pound sign £.

AUTO WRAP (SWITCH 3-2: 0=OFF, 1=ON)

When on, the auto wrap feature automatically moves the cursor from the last position of a line to the first position of the next line. When off, the cursor will stop upon reaching the right margin and each typed character will overlay the last character on the line. This feature does not transmit line feed or carriage return characters to the computer when moving to the next line.

LINE FEED/NEW LINE (SWITCH 3-3: 0=OFF, 1=ON)

When on, pressing the RETURN key generates both CR (CARRIAGE RETURN) and LF (LINE FEED) control characters. When LF control character is received it causes CR & LF, the cursor will both move down one line and move to the left margin. When off, only the CR control character is generated by pressing the RETURN key. When the LF control character is received, the cursor maintains its current column position but moves down one line. The terminal processes the Form Feed (FF) and Vertical Tab (VT) control characters as Line Feed (LF) characters.

LOCAL ECHO

When on, data transmitted to the computer is automatically displayed on the screen. When off, characters are transmitted only to the computer. The computer must echo back the characters to terminal for display.

PRINT TERMINATION CHARACTER (SWITCH 4-1: 0=NONE, 1=FORM FEED)

When on, a Form Feed (FF) control character is transmitted automatically after print screen operation. When off, print termination character is not transmitted.

When printing is complete, Carriage Return (CR) and Line Feed (LF) are always transmitted.

PRINT EXTENT (SWITCH 4-2: 0=SCROLL REG, 1=FULL SCREEN)

When full screen set, full screen characters will be printed in print screen operation. When set to scroll reg, only the characters in the scrolling region are printed. The scrolling region is defined by margins which are computer-set.

1 OR 2 STOP BITS (SWITCH 4-3: 0=1, 1=2)

This feature selects the number of stop bits, either 1 or 2, used by modem interface. Terminal stop bits selection must match that of computer. This feature does not affect the printer interface stop bits selection (determined by the printer transmit/receive speed feature in SET-UP.) See Chapter 7 for more information.

RECEIVE PARITY (SWITCH 4-4: 0=IGNORE, 1=CHECK)

When set to check, this feature checks bits of received characters for correct odd or even, as selected by SET-UP parity feature. Mark and space parity are not checked. If the check reveals a parity error, the substitution character (■) will appear in place of the character in error. When set to ignore, the check is not performed.

BREAK ENABLE (SWITCH 5-1: 0=OFF, 1=ON)

When on, pressing the BREAK key causes the BREAK character to be transmitted to the computer. When off, the BREAK key will not function by itself. Other uses of the BREAK key are not changed.

DISCONNECT CHARACTER ENABLE (SWITCH 5-2: 0=OFF, 1=ON)

When on, the terminal will disconnect from communication line upon receiving the disconnect character. Also, the terminal will disconnect if a long break disconnect occurs. The disconnect character is selected by the SET-UP TURNAROUND/DISCONNECT feature. When off, there is no disconnect performed when control characters are received.

DISCONNECT DELAY (SWITCH 5-3: 0=UK, 1=OTHERS)

The telephone system in the United Kingdom requires a different time sequence when the terminal disconnects from the communication line after the receive line signal detection is lost. When set to U.K. This feature is compatible with the United Kingdom system. This feature is used only when the SET-UP modem control features set to full duplex with modem control (FDX B or FDX C.), (for more information see Chapter 7.)

AUTO ANSWERBACK (SWITCH 5-4: =OFF, 1=ON)

When on, an answerback message is automatically generated each time a connection to the computer is performed. In half duplex communication, this message will not be transmitted until VA120 terminal can transmit. Answerback messages transmission are not affected by this feature when you use CTRL and BREAK.

INITIAL DIRECTION (HDX) (SWITCH 6-1: 0=RCV, 1=XMIT)

When on RCV, the terminal will begin half duplex communication by receiving. When XMIT, half duplex communication begins by transmitting. This feature is used only in half duplex HDX A or HDX B as selected by SET-UP feature.

AUTO TURNAROUND (SWITCH 6-2: 0=MANUAL, 1=AUTO)

When setting auto, the TURNAROUND character is automatically generated both after the RETURN key has transmitted characters, and at the end of the answerback message. The TURNAROUND character is selected by the SET-UP TURNAROUND/DISCONNECT feature. If a CR, or CARRIAGE RETURN character is selected, this is combined with the RETURN keys character and only one signal is generated on pressing the RETURN key. When this feature is set to manual, the CTRL key must

be used to generate a turnaround character. (See Chapter 5 for information about CTRL key use.) The auto turnaround feature is only used when the modem control SET-UP feature is set to half duplex coded control (HDX B.)

RS232C (SWITCH 6-3: 1=ENABLE, 0=DISABLE)

When RS232C is enabled, the primary (modem) port RS-232C interface provides signals and levels associated with RS-232C, allowing direct connection of computer or modem.

RS422/CURRENT LOOP (SWITCH 6-4: 1=RS422, 0=CURRENT LOOP)

Before either of these features is used, switch 6-3 RS232C must be disabled.

POWER (SWITCH 7-1: 0=60Hz, 1=50Hz)

VA 120 terminal matches power line frequency either 60 Hz or 50 Hz.

WPS TERMINAL (SWITCH 7-2: 0=OFF, 1=ON)

When on, this changes the position of the LINE FEED and SLASH(/) characters. This feature is used in the WORD PROCESSING mode.

MODEM DATA/PARITY BITS

This feature selects both the data bits per character, which can be either 7 or 8 bits, and the parity used in communication with the computer. When eight data bits per character is selected, the eight bit is set to 0 and is ignored. Parity used in the terminal's communication can be checked using the SET-UP RECEIVE PARITY feature. The parity selection is shown in detail on the Table 4-2. If no parity is chosen the parity bit is not transmitted or received.

TABLE 4-2 DATA/PARITY BITS SELECTION

7 DATA BITS PER CHARACTER

- 7M MARK PARITY
- 7S SPACE PARITY
- 7O ODD PARITY
- 7E EVEN PARITY
- 7N NO PARITY BIT

8 DATA BITS PER CHARACTER

- 8O ODD PARITY
- 8E EVEN PARITY
- 8N NO PARITY BIT

MODEM TRANSMIT SPEED

This feature selects the BAUD RATE of character transmissions by the terminal and must be compatible with receive speed of the computer. However the terminal transmit speed and terminal receive speed need not

match. Transmissions may be sent at speeds of 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 4800, 9600, or 19,200 BAUD.

MODEM RECEIVE SPEED

This feature selects the baud rate of character reception by the terminal and must be compatible with the computer's transmission rate. However, the terminal receive speed and terminal transmission speed need not match. Available receive speeds are the same as transmit speed selections listed under modem transmit speed above.

MODEM CONTROL

The feature can be set to HALF or FULL DUPLEX communication selections as listed in the Table below. Terminal and computer communication types must match.

Full Duplex Communication Selections

| | | |
|-------|--------------------------------------|--|
| FDX A | No EIA modem control data leads only | Use with null modem (direct) connection to computer or non-EIA modem controls. |
| FDX B | EIA modem control | Use with EIA modem control. |
| FDX C | Asymmetric, with EIA modem control | Use with HALF DUPLEX modem using secondary channel. |

Half Duplex Communication Selections

| | | |
|-------|------------------|---|
| HDX A | Supervisory mode | Use with secondary channel control lines indicating line turnaround indicators. |
| HDX B | Coded control | Use with control characters as line turnaround indicators. |

TURNAROUND (END OF CHARACTER BLOCK) / DISCONNECT CHARACTER

This feature selects:

- a turnaround character (which must be selected for modem control feature selection HDX B)
- a disconnect character (for all SET-UP HALF or FULL DUPLEX modem control feature selections)
- the end of block character (used in all modem protocol selections except HDX B).

The selection is as follows. Each character is followed by its mnemonic in parentheses. The turnaround/end of block characters are: FORM FEED (FF), END OF TEXT (EDT), END OF TRANSMISSION (EOT), CARRIAGE RETURN (CR), and DEVICE CONTROL 3 (DC 3). Each of these, except EOT, is matched by an EOT disconnect character. The EOT turnaround character is paired with a data link escape-end of transmission (DLE-EOT) disconnect character. If there is no turnaround-end of block character selected, then none is selected for disconnect.

The CR and DC 3 control characters may not be used as turnaround characters in ANSI x3.41 — 1977. They are not recommended for use, and DC 3 may only be selected if XON/XOFF feature is off.

PRINTER DATA/PARITY BITS

This feature selects data bits per character and parity for the printing mode. The selection is the same as that in the SET-UP B modem data parity bits feature, see above for Table and description. The XON/XOFF control characters can be used to prevent character loss from an overfull input buffer. However, the terminal receives no communications from the printer.

PRINTER RECEIVE/TRANSMIT SPEED

This feature selects the BAUD RATE of character transmission between printer and terminal. The printer interface must have matching receive and transmit rates, and these rates must match the serial printer transmit and receive rates. Rates are 75, 110,

134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 4800, 9600, and 19,200 BAUD. Two stop bits per character are used by the printer interface for rates less than 110 BAUD. Over 110 BAUD, one stop bit is used.

ANSWERBACK

ANSWERBACK is an identification code sent to the computer by the terminal, either automatically when requested by the computer (by use of the ENQ, HEX 05 enquire character) or manually. When manually operated, press the CTRL key down and hold, then press the BREAK key, then release both. To store an answerback message in the user memory, perform a store operation.

The ANSWERBACK message in the terminal must match that of the computer. Where this message is being entered into the terminal, ANSWERBACK can be used.

2.4. SET-UP C Features

EDIT MODE (switch A-1: 0 = OFF, 1 = ON)

When on, the terminal will operate in editing mode. When off, the terminal is in interactive mode. This feature does not change the function of the EDIT key.

EDIT KEY (Switch A-2: 0 = Deferred, 1 = Immediate)

When deferred, pressing the SHIFT key and EDIT key will transmit a sequence of characters to the computer. When these characters are echoed back, the terminal changes between interactive and editing operation. When immediate is selected, the SHIFT and EDIT key selects either interactive or editing mode immediately.

Guarded Area Transfer (Switch A-3: 0 = Unprotected, 1 = All)

When this feature is set to all, both protected and unprotected characters will be transmitted from the

terminal to the computer. When set to unprotected, characters that are designated as protected are not transmitted to the computer; only the unprotected areas of the screen are transmitted.

Space Compression (Switch A-4: 0=OFF, 1=ON)

When on, the unused areas of the screen are transmitted to the editor as a single control character. When off, each empty space is transmitted.

Line Transmit (Switch B-1: 0=OFF, 1=ON)

When on, characters are transmitted to the computer one line at a time when the return or enter key is pressed. When off, character transmission is performed according to selection by the SET-UP termination feature.

Transmit Termination (Switch B-2: 0=Partial Page, 1=Full Page)

When set to full page, full page characters with the margins are transmitted (using **ENTER** key). When set to partial page, the amount of characters transmitted is between partial page marker and the cursor. If partial page marker is not selected, top margin substitutes. The marker moves automatically to the last character transmitted.

Transmit Execution (Switch B-4: 0=Deferred, 1=Immediate)

When set to deferred, the terminal performs its enter function by sending a character sequence to request transmission, and transmission will not start until receiving a response that the computer is ready to receive. When set to immediate, pressing the **ENTER** key begins transmission of the characters immediately.

Bold Protected (Switch C-1: 0=OFF, 1=ON)

When on, the Bold characters on the screen are protected and may not be edited.

Underline Protected (Switch C-2: 0=OFF, 1=ON)

When on, underlined characters on the screen are protected and may not be edited.

Blink Protected (Switch C-3: 0=OFF, 1=ON)

When on, blinking characters on the screen are protected and may not be edited.

Reverse Protected (Switch C-4: 0=OFF, 1=ON)

When on, characters which appear on the screen in a screen background that is opposite of the SET-UP screen background will be protected and may not be edited.

Normal Protected (Switch D-1: 0=OFF, 1=ON)

When on, characters which are not Bold, underlined, blinking, or on reverse backgrounds are protected and may not be edited.

Erase Mode (Switch D-2: 0=Unprotected, 1=All)

When set to all, protected and unprotected areas of the screen may all be edited by the computer. When set to unprotected, only the unprotected characters may be edited.

End of Line Character Enable (Switch D-3: 0=OFF, 1=ON)

When on, the end of line character is transmitted during a transmission of characters.

End of Line Character (Switch D-4: 0=CR/CRLF,

1 = RS)

This feature selects the end of line character to be transmitted during block transmission. Either the RS character or characters selected by SET-UP LINE FEED/NEW LINE feature (transmitted by the RETURN key) may be used. This feature has no effect if the SET-UP LINE FEED/NEW LINE feature has selected a CR character as transmission character, in which case RS is automatically selected.

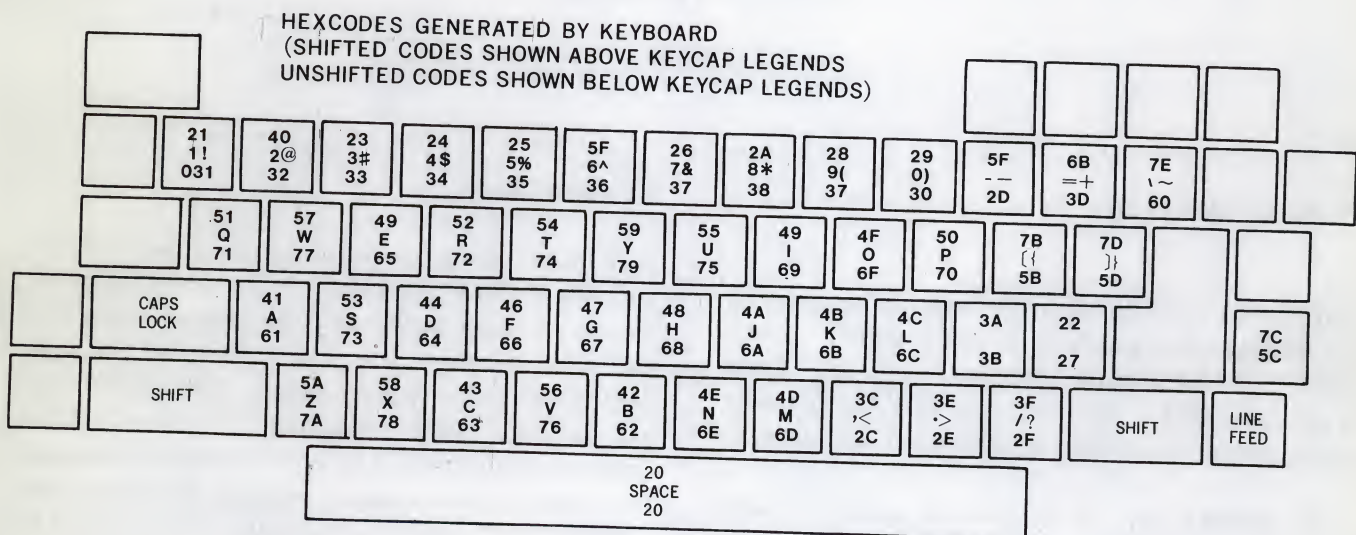
Chapter 5-Transmitted Characters

I. GENERAL

The general use of the keys on the **VA 120** terminal keyboard has been described in Chapter 1. This Chapter 5 is concerned with the transmission of character codes. There are three types of keys on the **VA 120** terminal: **STANDARD KEYS** (see Figure 5-1), **FUNCTION KEYS** (see Figure 5-2) and **AUXILIARY KEYPAD KEYS** (See Figure 5-3).

1. STANDARD KEYS

The STANDARD KEYS generate codes determined by ASCII, or American Standard Code for Information Interchange (Figure 5-1). These keys generate both lower and uppercase codes. Lowercase codes are generated unless either a shift key or the caps lock is down. When a **SHIFT** key is pressed, uppercase ASCII character codes are generated. When **CAPS LOCK** key is down, the 26 alphabetic keys generate uppercase character codes.



NOTE: THE/AND LINE FEED KEYS FUNCTION AS SHOWN WHEN THE WPS TERMINAL KEYBOARD FEATURE IS OFF (0) WHEN WPS TERMINAL KEYBOARD IS ON (1) THESE KEYS SWITCH FUNCTIONS.

Figure 5-1 Standard Key Codes

2. FUNCTION KEYS

The FUNCTION KEYS are defined by the software

or communication system in use. Generally, they can be described as follows (Figure 5-2).

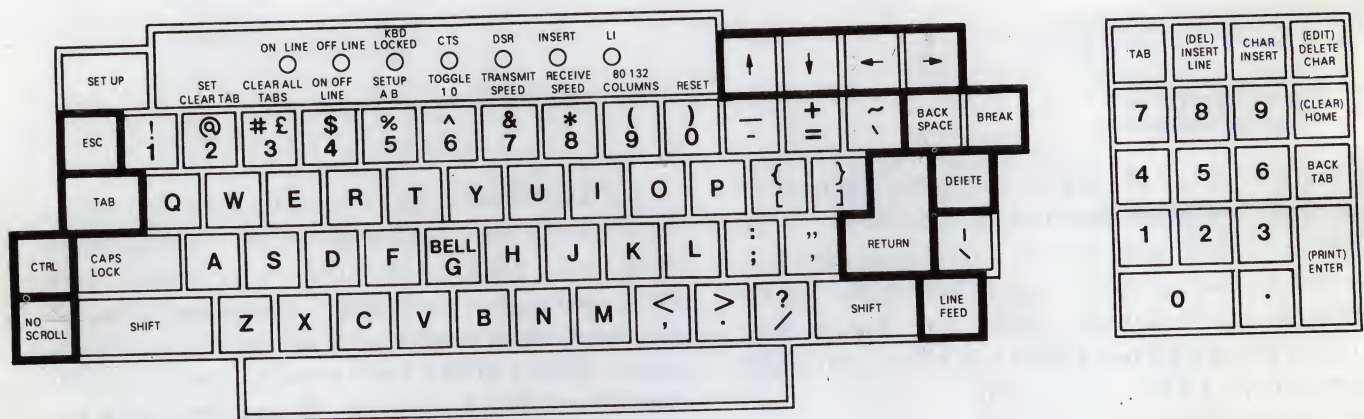


Figure 5-2 VA120 Function Keys

2.1 Break/'Here Is' Key

When SET-UP BREAK enable feature is on, pressing the **BREAK** key generates a break signal. When SET-UP BREAK enable feature is off, this signal is not generated. However, the **BREAK** key may still be used in other keys sequences and not affected.

The **BREAK** key can be used to generate a long break disconnect: First depress **SHIFT** key and hold, then press **BREAK** key. Result is a long break disconnect which disconnects terminal from communication line (see Chapter 7 for more information).

The **HERE IS** key can be used to generate an ANSWERBACK message: First depress **CTRL** key and hold, then press **HERE IS** key. (see Chapter 4 for more information).

2.2 Cursor Keys

Character codes generated by these keys depend upon the ANSI/VT 52 feature. When ANSI is selected, the use of cursor key mode is determined by the keypad mode selection. If keypad mode is set for alternate (application) keypad mode, then cursor keys will generate either application or cursor control sequences as determined by cursor key mode selection. If numeric keypad mode is selected, the cursor keys generate ANSI cursor commands. The cursor key mode and the selection of alternate (application) or numeric keypad modes are determined by the computer. (see Chapter 6 for more information).

When VA 52 is selected, VT 52 cursor control sequences are generated by these keys. Both VT 52 and ANSI cursor key character codes are listed in Table 5-1.

TABLE 5-1 CURSOR CONTROL KEY CODES

| ANSI MODE | | | | | | | | |
|------------|-----------|---------|---------|-----------|---------|---------|-----------|---------|
| CURSOR KEY | RESET | | | SET | | | VT52 | MODE |
| ↑ (UP) | ESC 1B | [5B | A 41 | ESC 1B | 0 4F | A 41 | ESC 1B | A 41 |
| ↓ (DOWN) | ESC 1B | [5B | B 42 | ESC 1B | 0 4F | B 42 | ESC 1B | B 42 |
| → (RIGHT) | ESC 1B | [5B | C 43 | ESC 1B | 0 4F | C 43 | ESC 1B | C 43 |
| ← (LEFT) | ESC 1B | [5B | D 44 | ESC 1B | 0 4F | D 44 | ESC 1B | D 44 |

2.3 Control Character Keys (See Figure 5-3)

These keys are used to generate CONTROL characters listed in Table 5-2 and Figure 5-3. The function of CONTROL characters is determined by the computer system. There are two different ways to generate CONTROL characters. The first is used for the following keys:

ESC
TAB
BACK SPACE
DELETE
RETURN
LINE FEED

These keys (above) do not use the CTRL key to generate control characters. When pressed they will generate CONTROL characters by themselves.

The other keys (unshaded in Figure 5-3) will generate CONTROL characters only when the CTRL key is

pressed.

Note that the RETURN and ENTER keys may generate the same control codes depending upon the auxiliary keypad mode selected. The RETURN key can generate codes determined by:

- (1) The SET-UP AUTO TURNAROUND feature, when the modem protocol SET-UP feature is selected for HDX B. If the TURNAROUND character is selected by CARRIAGE RETURN, only a single carriage return is transmitted by the RETURN key.
- (2) The LINE FEED/NEW LINE feature. When on, both a CARRIAGE RETURN and a LINE FEED are generated by pressing the RETURN key. When LINE FEED/NEW LINE is off, only a CARRIAGE RETURN is transmitted by the RETURN key.

GELDEND IN EDIT-MODE !

TABLE 5-2 CONTROL CODES GENERATED

| CONTROL CHARACTER | MNEMONIC | TRANSMITTED CODE (HEX) | KEY PRESSED WITH CTRL | DEDICATED KEY |
|-----------------------------------|-------------|------------------------|-----------------------|---------------|
| Null | NUL | 0 | Space bar | — |
| Start of heading | SOH | 1 | A | — |
| Start of text | STX | 2 | B | — |
| End of text | ETX | 3 | C | — |
| End of transmission | EOT | 4 | D | — |
| Enquire | ENQ | 5 | E | — |
| Acknowledge | ACK | 6 | F | — |
| Bell | BEL | 7 | G | — |
| Back space | BS | 8 | H | Back space |
| Horizontal tabulation | HT | 9 | I | Tab |
| Line feed | LF | A | J | Line feed |
| Vertical tabulation | VT | B | K | — |
| Form feed | FF | C | L | — |
| Carriage return | CR | D | M | Return* |
| Shift out | SO | E | N | — |
| Shift in | SI | F | O | — |
| Data link escape | DLE | 10 | P | — |
| Device control 1 | DC 1 (XON) | 11 | Q | — |
| Device control 2 | DC 2 | 12 | R | — |
| Device control 3 | DC 3 (XOFF) | 13 | S | — |
| Device control 4 | DC 4 | 14 | T | — |
| Negative acknowledge | NAK | 15 | U | — |
| Synchronous idle | SYN | 16 | V | — |
| End of transmission block | ETB | 17 | W | — |
| Cancel previous word or character | CAN | 18 | X | — |
| End of medium | EM | 19 | Y | — |
| Substitute | SUB | 1A | Z | — |
| Escape | ESC | 1B | / | — |
| File separator | FS | 1C | | — |
| Group separator | GS | 1D | | — |
| Record separator | RS | 1E | | — |
| Unit separator | US | 1F | ? | — |

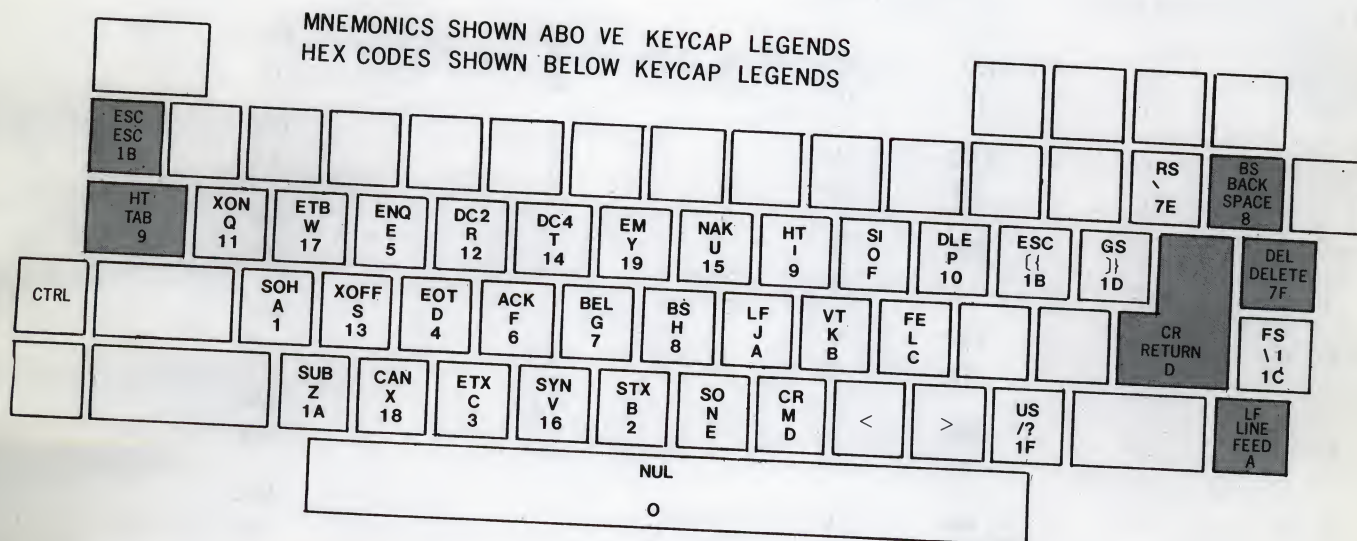


Figure 5-3 Function Key Control Codes

3. NUMERIC KEYPAD KEYS

The type characters generated by numeric keypad keys depend on the selection of ANSI/VT 52 feature and alternate (application) keypad mode. The computer selects the application keypad mode. Refer to Chapter 6 for more information about keypad character selection.

When numeric keypad mode is selected instead of application keypad mode, the numeric keypad generates the numeric, comma, period, and minus sign characters used by the main keyboard. When application keypad mode is selected, the numeric keypad generates control functions. Characters generated by the numeric keypad are listed in Table 5-3.

The auxiliary keypad keys generate characters according to the selection of the ANSI/VT 52 feature

and alternate (application) keypad mode (selected by the computer). For more information, see Chapter 6.

When alternate (application) keypad mode is selected, the auxiliary keypad generates control functions as listed in Table 5-3. When numeric keypad mode is instead selected, the auxiliary keyboard generates the same numeric and punctuating character codes as those on the main keyboard.

Also, when numeric keypad mode is selected, the **LINE FEED/NEW LINE** feature can be used to change the character code generated by pressing the **ENTER** key. When **LINE FEED/NEW LINE** is on, the **ENTER KEY** generates both the **CARRIAGE RETURN (CR)** character and the **LINE FEED (LF)** character. When off, only the **CARRIAGE RETURN** control character is transmitted.

TABLE 5-3 KEYPAD CODES

| Key | ANSI Mode | | | VT52 mode | | |
|--------|------------------------|----------------------------|---------|------------------------|----------------------------|-------------------------------|
| | Numeric Keypad Mode | Application Keypad Mode | | Numeric Keypad mode | Application Keypad mode | |
| 0 | 0 30 | ESC 1B | 0 4F | p 50 | 0 30 | ESC 1B ? 3F p 50 |
| 1 | 1 31 | ESC 1B | 0 4F | q 51 | 1 31 | ESC 1B ? 3F q 51 |
| 2 | 2 32 | ESC 1B | 0 4F | r 52 | 2 32 | ESC 1B ? 3F r 52 |
| 3 | 3 33 | ESC 1B | 0 4F | s 53 | 3 33 | ESC 1B ? 3F s 53 |
| 4 | 4 34 | ESC 1B | 0 4F | t 54 | 4 34 | ESC 1B ? 3F t 54 |
| 5 | 5 35 | ESC 1B | 0 4F | u 55 | 5 35 | ESC 1B ? 3F u 55 |
| 6 | 6 36 | ESC 1B | 0 4F | v 56 | 6 36 | ESC 1B ? 3F v 56 |
| 7 | 7 37 | ESC 1B | 0 4F | w 57 | 7 37 | ESC 1B ? 3F w 57 |
| 8 | 8 38 | ESC 1B | 0 4F | x 58 | 8 38 | ESC 1B ? 3F x 58 |
| 9 | 9 39 | ESC 1B | 0 4F | y 79 | 9 39 | ESC 1B ? 3F y 79 |
| - | — (minus) 20 | ESC 1B | 0 4F | m 40 | — (minus) 20 | ESC 1B ? 3F m 6D |
| , | , (comma) 2C | ESC 1B | 0 4F | l 6C | , (comma) 2C | ESC 1B ? 3F l 6C |
| . | . (period) 2E | ESC 1B | 0 4F | n 6E | . (period) 2E | ESC 1B ? 3F n 6E |
| Enter+ | CR or CR LF D D A | ESC 1B | 0 4F | M 4D | CR or CR LF D D A | ESC 1B ? 3F M 4D |

TABLE 5-3 KEYPAD (Continued)

| Key | ANSI Mode | | | | | | VT52 Mode | | | | |
|-----|---------------------|---------|---------|-------------------------|---------|---------|---------------------|---------|-------------------------|---------|--|
| | Numeric Keypad Mode | | | Application Keypad Mode | | | Numeric Keypad Mode | | Application Keypad Mode | | |
| PF1 | ESC 1B | O 4F | P 50 | ESC 1B | O 4F | P 50 | ESC 1B | P 50 | ESC 1B | P 50 | |
| PF2 | ESC 1B | O 4F | Q 51 | ESC 1B | O 4F | Q 51 | ESC 1B | Q 51 | ESC 1B | Q 51 | |
| PF3 | ESC 1B | O 4F | R 52 | ESC 1B | O 4F | R 52 | ESC 1B | R 52 | ESC 1B | R 52 | |
| PF4 | ESC 1B | O 4F | S 53 | ESC 1B | O 4F | S 53 | ESC 1B | S 53 | ESC 1B | S 53 | |

* These sequences are not generated by the VT52 terminal.

NOTE: In numeric keypad mode (application keypad mode off), you can change the ENTER character code with the LINE FEED/NEW LINE feature. When off, this feature causes ENTER to generate a single control character (CR, HEX 0D). When on, this feature causes ENTER to generate two characters (CR, HEX 0D and LF, HEX 0A).

II. TRANSMITTING CHARACTERS IN THE EDIT MODE

When in the EDIT mode, transmission of characters to the computer is not performed until directed by either the computer or keyboard. Until transmission, the characters are placed in the display memory and can be altered as desired.

The computer uses a transmission sequence in order to request transmission. The keyboard uses the ENTER key, to request transmission.

The keyboard will be in locked condition, while the computer is transmitting. The transmission can be stopped, all transmission requests cleared, and keyboard unlocked, all by entering and exiting SET-UP.

1. TRANSMIT EXECUTION MODE

Transmit execution mode determines the way of block transmission. When the mode set, immediate transmission will be carried out by pressing the ENTER key.

When reset, pressing the ENTER key causes the SET TRANSMIT STATE (STS) sequence (ESC S, HEX 1B 54) to be transmitted to the computer. The terminal delays transmission of characters until it receives the transmit (DECXMIT) sequence from the computer.

2. SIZE OF BLOCK TRANSMISSION

The size is determined by both line transmit mode (DECLTM) and transmit termination mode (TTM). The sizes available are line, partial page or full page. To select block size:

Line transmit
(DECLTM) mode set

Line Transmit
(DECLTM) mode reset

Transmit
termination (TTM)
mode set.

- (1) Cursor line transmission after current line has been transmitted, cursor moves to the start next line, first position of next unprotected field, or to first unprotected field of current line (when no more line or protected field available)

Transmit
termination (TTM)
mode reset

- (2) Same as above

- (1) Full page transmission — full screen is transmitted.

- (2) Partial page transmission — scrolling region from top left-hand corner or last partial page transmit marker to the cursor is transmitted. Partial page transmit marker is in display memory. It is non-displayable. If there is in marker, or the cursor front of marker. Transmission starts from the beginning of the scroll region.

3. NUMBER OF CHARACTERS TRANSMITTED

The number of characters transmitted is determined by both the SPACE COMPRESSION/FIELD DELIMITER mode (DECSCFDM) and the GUARDED AREA TRANSMIT MODE (GATM). These modes determine number of characters transmitted in the following ways:

DELETE DEL 7F DELETE

*The numeric keypad mode determines whether RETURN and ENTER generate the same control codes. The codes generated by RETURN are changed

by two feature selections

The AUTO TURNAROUND SET-UP feature when using HALF-DUPLEX coded control (HDX B). The TURNAROUND/DISCONNECT SET-UP feature selects the turnaround character. If the turnaround character is CARRIAGE RETURN (CR), the terminal transmits only one CR when you press RETURN.

The LINE FEED/NEW LINE feature. When this feature is on, RETURN generates two characters (CR, LF). When this feature is off, RETURN generates a CR.

Chapter 6 Processing Received Characters

I. CHARACTER STANDARDS

Characters are processed according to American National Standards Institute (ANSI) standards X3.64 — 1979, X3.4 — 1977, and X3.41 — 1974. Table 6-1 shows ASCII defined by ANSI standard X3.4. This Table corresponds to the International Standards Organization (ISO) standard 646 and the International Telegraph and Telephone Consultative Committed alphabet #5.

This chapter provides detailed information on how character codes are processed when received by the VA 120 terminal. The terminal receives two types of characters: displayable characters and control characters (ANSI definitions). These are both displayed in Table 6-1.

1. DISPLAYABLE CHARACTERS

Displayable characters are those which appear on the video screen. The actual characters displayed

are those selected in the terminal's specific character set, which is selected by using control functions. (More information on character sets will follow in this chapter.)

Displayable characters appear on Table 6-1 in columns 2 through 8. One of the displayable characters, the space character, is also considered to be an information separator character. The delete character (DEL) is, however, a control character.

2. CONTROL CHARACTERS

Control characters are single character control functions which start, modify, or stop control functions. They are not displayed. See Table 6-2 for those control characters which are recognized by the terminal; other control characters will be ignored by the terminal. Detailed descriptions of each control character function follow below.

Control characters are shown in Table 6-1 in columns 0 and 1.

Table 6-1 ASCII Table

| BITS | | | 0 | | 0 | | 0 | | 0 | | 1 | | 1 | | 1 | | 1 | | | |
|------|----|----|--------|-----|-----|---------------|---------------|----------------|----|----------------|---|----------------|---|-----------------|---|-----------------|---|------------------|-----|------------------|
| | | | 0 | | 0 | | 1 | | 0 | | 1 | | 0 | | 1 | | 1 | | | |
| | | | COLUMN | | | | | | | | | | | | | | | | | |
| B4 | B3 | B2 | B1 | ROW | 0 | | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | |
| 0 | 0 | 0 | 0 | 0 | NUL | 0 0 0 | DLE | 20 16 10 | SP | 40 32 20 | 0 | 60 48 30 | @ | 100 64 40 | P | 120 80 50 | \ | 140 96 60 | p | 160 112 70 |
| 0 | 0 | 0 | 1 | 1 | SOH | 1 1 1 | DC1 (XON) | 21 17 11 | ! | 41 33 21 | 1 | 61 49 31 | A | 101 65 41 | Q | 121 81 51 | a | 141 97 61 | q | 161 113 71 |
| 0 | 0 | 1 | 0 | 2 | STX | 2 2 2 | DC2 | 22 18 12 | " | 42 34 22 | 2 | 62 50 32 | B | 102 66 42 | R | 122 82 52 | b | 142 98 62 | r | 162 114 72 |
| 0 | 0 | 1 | 1 | 3 | ETX | 3 3 3 | DC3 (XOFF) | 23 19 13 | # | 43 35 23 | 3 | 63 51 33 | C | 103 67 43 | S | 123 83 53 | c | 143 99 63 | s | 163 115 73 |
| 0 | 1 | 0 | 0 | 4 | EOT | 4 4 4 | DC4 | 24 20 14 | \$ | 44 36 24 | 4 | 64 52 34 | D | 104 68 44 | T | 124 84 54 | d | 144 100 64 | t | 164 116 74 |
| 0 | 1 | 0 | 1 | 5 | ENQ | 5 5 5 | NAK | 25 21 15 | % | 45 37 25 | 5 | 65 53 35 | E | 105 69 45 | U | 125 85 55 | e | 145 101 65 | u | 165 117 75 |
| 0 | 1 | 1 | 0 | 6 | ACK | 6 6 6 | SYN | 26 22 16 | & | 46 38 26 | 6 | 66 54 36 | F | 106 70 46 | V | 126 86 56 | f | 146 102 66 | v | 166 118 76 |
| 0 | 1 | 1 | 1 | 7 | BEL | 7 7 7 | ETB | 27 23 17 | ' | 47 39 27 | 7 | 67 55 37 | G | 107 71 47 | W | 127 87 57 | g | 147 103 67 | w | 167 119 77 |
| 1 | 0 | 0 | 0 | 8 | BS | 10 8 8 | CAN | 30 24 18 | (| 50 40 28 | 8 | 70 56 38 | H | 110 72 48 | X | 130 88 58 | h | 150 104 68 | x | 170 120 78 |
| 1 | 0 | 0 | 1 | 9 | HT | 11 9 9 | EM | 31 25 19 |) | 51 41 29 | 9 | 71 57 39 | I | 111 73 49 | Y | 131 89 59 | i | 151 105 69 | y | 171 121 79 |
| 1 | 0 | 1 | 0 | 10 | LF | 12 10 A | SUB | 32 26 1A | * | 52 42 2A | : | 72 58 3A | J | 112 74 4A | Z | 132 90 5A | j | 152 106 6A | z | 172 122 7A |
| 1 | 0 | 1 | 1 | 11 | VT | 13 11 B | ESC | 33 27 1B | + | 53 43 2B | ; | 73 59 3B | K | 113 75 4B | [| 133 91 5B | k | 153 107 6B | { | 173 123 7B |
| 1 | 1 | 0 | 0 | 12 | FF | 14 12 C | FS | 34 28 1C | , | 54 44 2C | < | 74 60 3C | L | 114 76 4C | \ | 134 92 5C | l | 154 108 6C | l | 174 124 7C |
| 1 | 1 | 0 | 1 | 13 | CR | 15 13 D | GS | 35 29 1D | - | 55 45 2D | = | 75 61 3D | M | 115 77 4D |] | 135 93 5D | m | 155 109 6D | } | 175 125 7D |
| 1 | 1 | 1 | 0 | 14 | SO | 16 14 E | RS | 36 30 1E | . | 56 46 2E | > | 76 62 3E | N | 116 78 4E | ^ | 136 94 5E | n | 156 110 6E | ~ | 176 126 7E |
| 1 | 1 | 1 | 1 | 15 | SI | 17 15 F | US | 37 31 1F | / | 57 47 2F | ? | 77 63 3F | O | 117 79 4F | _ | 137 95 5F | o | 157 111 6F | DEL | 177 127 7F |

KEY

ASCII CHARACTER

ESC

33
27
1BOCTAL
DECIMAL
HEX

TABLE 6-2 CONTROL CHARACTERS RECOGNIZED BY VA 120

| NAME | CONTROL CHARACTER MNEMONIC | HEX CODE | FUNCTION |
|---------------------|----------------------------------|-------------|---|
| NULL | NUL | 0 | Ignored when received (not stored in input buffer) used as a fill character. |
| END OF TEXT | ETX | 3 | Can be selected as a half duplex turnaround character. |
| END OF TRANSMISSION | EOT | 4 | Can be selected as a disconnect character or as a half duplex turnaround character. When used as a turnaround character, the disconnect character is DLE-EOT. |
| ENQUIRE | ENQ | 5 | Transmits answerback message. |
| BELL | BEL | 7 | Bell tone. |
| BACKSPACE | BS | 8 | Moves the cursor to the left by one space. When cursor at the left margin, no action occurs. |
| HORIZONTAL | HT | 9 | Moves the cursor to the next tab stop, or to the right margin if no more TAB stops available. When TAB is received, cursor moves to one of the followings: <ul style="list-style-type: none"> * The next TAB stop * The next field boundary (if erasure mode is set) * The next unprotected field (if erasure mode is reset) * The last character position of the screen (if the cursor is outside the scrolling region). |
| LINE FEED | LF | A | Causes a line feed or a new line operation. (refer to line feed/new line mode). |

TABLE 6-2 CONTROL CHARACTERS RECOGNIZED BY VA 120 (Continued)

| NAME | CONTROL CHARACTER MNEMONIC | HEX CODE | FUNCTION |
|---------------------|----------------------------------|-------------|--|
| VERTICAL | VT | B | Processed as LF. |
| FORM FEED | FF | C | Processed as LF. Can also be selected as a half duplex turnaround character. |
| CARRIAGE | CR | D | Moves cursor to left margin on the cursor line. Can also be selected as a half duplex turnaround character. |
| SHIFT OUT | SO | E | Selects G1 character set, as designated by a select character set sequence. |
| SHIFT IN | SI | F | Select G0 character set, as designated by a select character set sequence. |
| DEVICE CONTROL 1 | DC1 | 11 | Processed as XON. Causes terminal to continue transmitting characters. |
| DEVICE CONTROL 3 | DC3 | 13 | Processed as XOFF. Causes terminal to stop transmitting all characters except XOFF and XON. This character can also be selected as a half duplex turnaround character. |
| CANCEL | CAN | 18 | If received during an escape or control sequence, the sequence cancelled and the substitution character is displayed. |
| SUBSTITUTE | SUB | 1A | Processed as CAN. |
| ESCAPE | ESC | 1B | Processed as a sequence leading code. |

II. ESCAPE AND CONTROL SEQUENCES

ESCAPE and CONTROL sequences are not displayed, they control terminal operation. They are defined by ANSI X3.64 — 1977 and X3.64 — 1979. The VA 120 terminal can use either VT 52 mode or ANSI mode. The ANSI compatible control sequences have a mnemonic assigned by ANSI (see Table 6-3). Those defined by DIGITAL are termed ANSI private sequences and the mnemonic are prefixed by DEC (see Table 6-3).

A summary of all control functions is provided in programming summary.

Be sure to use the ESCAPE and CONTROL sequences as shown in programming summary.

RECOVERY OF ERRORS

Errors may occur in the control function received by the terminal. These errors include: incorrect parameters, invalid control functions and control characters within control function sequences. Present standards do not define how these errors should be handled by the terminal. When errors are met, the terminal recovers by performing as much as possible the function. General procedures follow:

THE TERMINAL

- *Ignores — Control functions not recognized by the terminal.
- *Ignores — Control functions that, although valid, do not appear in this manual. Terminal may not perform results expected.
- *Performs — The function of a control character, then the sequence, if the control character is received with control sequence.

*Aborts — The current sequence, if a cancel (CAN HEX 18) or a substitute (SUB HEX 1A) are received during this sequence. A substitute character will then be displayed, followed by the characters of the sequence received after the SUB or CAN.

1. ANSI COMPATIBLE SEQUENCES

ANSI compatible features can be selected for use by the terminal from SET-UP (see Table 6-4), or by a sequence of VT 52 compatible sequences generated by computer.

The ANSI compatible sequences are described below. Table 6-5 provides an easy reference guide showing each ANSI sequence with its mnemonic and character sequence.

ANSI COMPATIBLE SEQUENCES: EXPLANATION AND USAGE

The operation of the VA 120 terminal is changed by using SET-UP features and modes. These can be selected by the user from the keyboard or by control codes from the computer. Computer selections are not stored in user memory, only in the operating memory.

The terminal has some features which affect operation, called modes. Once a selection is made, the terminal will continue to use it until the mode is changed by computer or user. The computer can change modes by using the SET MODE (SM) or RESET MODE (RM) sequences. To set and reset the modes of VA 120 terminal, follow the sequences in Table 6-5. A further explanation of these features and modes follows.

TABLE 6-3 ANSI SPECIFIED/ANSI PRIVATE MODES

| NAME | MNEMONIC | ANSI SPECIFIED OR ANSI PRIVATE | PARAMETER (PS) |
|---------------------------------------|-------------|-----------------------------------|-------------------|
| ERROR (IGNORED) | — | ANSI SPECIFIED | 0 |
| GUARDED AREA TRANSFER | GATM | ANSI SPECIFIED | 1 |
| KEYBOARD ACTION | KAM | ANSI SPECIFIED | 2 |
| INSERTION-REPLACEMENT | IRM | ANSI SPECIFIED | 4 |
| ERASURE | ERM | ANSI SPECIFIED | 6 |
| SEND-RECEIVE | SRM | ANSI SPECIFIED | 12 |
| TRANSFER TERMINATION | TTM | ANSI SPECIFIED | 16 |
| LINE FEED/NEW LINE MODE | LMN | ANSI SPECIFIED | 20 |
| ERROR (IGNORED) | NO MNEMONIC | ANSI PRIVATE | 0 |
| CURSOR KEY | DECKM | ANSI PRIVATE | 1 |
| ANSI/VT 52 | DECANM | ANSI PRIVATE | 2 |
| COLUMN | DECCOLM | ANSI PRIVATE | 3 |
| SCROLL | DECSCLM | ANSI PRIVATE | 4 |
| SCREEN | DECSCNM | ANSI PRIVATE | 5 |
| ORIGIN | DECOM | ANSI PRIVATE | 6 |
| AUTO WRAP | DECAWM | ANSI PRIVATE | 7 |
| AUTO REPEAT | DECARM | ANSI PRIVATE | 8 |
| EDITING | DECEDM | ANSI PRIVATE | 10 |
| LINE TRANSMIT | DECLTM | ANSI PRIVATE | 11 |
| SPACE COMPRESSION/ FIELD DELIMITER | DECSCFDM | ANSI PRIVATE | 13 |
| TRANSMIT EXECUTION | DECTEM | ANSI PRIVATE | 14 |
| EDIT KEY EXECUTION | DECEKEM | ANSI PRIVATE | 16 |
| PRINTER FORM FEED | DECPFF | ANSI PRIVATE | 18 |
| PRINTER EXTENT | DECPEX | ANSI PRIVATE | 19 |

NOTE: ANSI specified or ANSI private modes listed in this Table are selected using the general set and reset procedure described under RESET (RM) and SET (SM) modes in Table 6-5. Alternate and numeric keyboard modes are not selected by the SET and RESET MODE sequences (see keypad character selection in this Chapter).

TABLE 6-4 SET-UP FEATURES AND MODES

| NAME | CHANGED FROM COMPUTER AND MNEMONIC | CHANGED FROM KEYBOARD IN SET-UP | USES SET (SM) AND RESET (RM) SEQUENCES |
|------------------------|--|---------------------------------------|--|
| ON/OFF LINE | | X | |
| SCREEN BRIGHTNESS | | X | |
| COLUMNS PER LINE | X (DECCOLM) | X | X |
| TAB STOPS | X (HTS/TBC) | X | |
| SCROLL | X (DECSCLM) | X | X |
| AUTO REPEAT | X (DECARM) | X | X |
| SCREEN BACK GROUND | X (DECSCNM) | X | X |
| CURSOR | | X | |
| MARGIN BELL | | X | |
| KEYCLICK | | X | |
| ANSI/VT 52 | X (DECANM) | X | X |
| AUTO XON/XOFF | | X | |
| US/UK CHAR SET | X (SCS) | X | |
| AUTO WRAP | X (DECAWM) | X | X |
| LINE FEED/NEW LINE | X (LNM) | X | X |
| LOCAL ECHO | X (SRM) | X | X |
| PRINT TERM. CHAR. | X (DECPFF) | X | X |
| PRINTER EXTENT | X (DECPEX) | X | X |
| 1 OR 2 STOP BITS | | X | |
| RECEIVE PARITY | | X | |
| BREAK ENABLE | | X | |
| DISCONNECT CHAR ENABLE | | X | |
| AUTO ANSWERBACK ENABLE | | X | |
| INITIAL DIRECTION | | X | |
| AUTO TURNAROUND | | X | |
| POWER | | X | |
| WPS TERMINAL | | X | |
| CLOCK | | X | |
| MODEM DATA/PARITY BITS | | X | |
| TRANSMIT SPEED | | X | |
| RECEIVE SPEED | | X | |
| MODEM CONTROL | | X | |

TABLE 6-4 SET-UP FEATURES AND MODES (Continued)

| | | | |
|---|---------------------|---|---|
| TURNAROUND (END OF TRANS.)/DISCONNECT CHAR | XX(DECTTC) | X | |
| PRINTER DATA/PARITY BITS | | X | X |
| TRANSMIT/RECEIVE SPEED | | X | X |
| EDIT MODE | X (DECEDM) | X | X |
| EDIT KEY EXECUTION MODE | X (DECEKEM) | X | X |
| GUARDED AREA TRANSFER MODE | X (GATM) | X | X |
| SPACE COMPRESSION/FIELD | X (DECSCFDM) | X | X |
| DELIMITER MODE | | | |
| LINE TRANSMIT MODE | X (DECLTM) | X | X |
| TRANSMIT TERMINATION MODE | X (TTM) | X | X |
| TRANSMIT EXECUTION MODE | X (DECTEM) | X | X |
| BOLD PROTECT | X (DECPRO) | X | X |
| UNDERLINE PROTECT | X (DECPRO) | X | X |
| BLINK PROTECT | X (DECPRO) | X | X |
| REVERSE VIDEO PROTECT | X (DECPRO) | X | X |
| NORMAL PROTECT | X (DECPRO) | X | X |
| ERASURE MODE | X (ERM) | X | X |
| END OF LINE CHAR ENABLE | | X | X |
| END OF LINE CHAR | | X | X |
| ALT KEYPAD MODE/NUMERIC KEYPAD MODE | X (DECKPAM/DECKPNM) | | |
| CURSOR KEY MODE | X (DECCKM) | | |
| ORIGIN MODE | X (DECOM) | | X |
| INSERT-REPLACE MODE | X (IRM) | | X |
| KEYBOARD ACTION MODE | X (KAM) | | X |

PERMANENT MODE SELECTIONS

A number of modes used by the VA 120 terminal are permanently selected and may not be changed. These modes are listed below. They may be selected as set, reset, or non-applicable.

(1) Control Representation (CRM)

Causes control functions to be performed without displaying any control characters on screen.

(2) Editing

Prevents erasing or cursor positioning function from being performed outside of the margins, and also causes characters moved outside margins to be lost. The horizontal position (HVP) and cursor position sequences are not affected.

(3) Format Effector Action (FEAM)

Causes screen display control functions to be performed immediately.

(4) Horizontal Editing (HEM)

Causes characters on a line to be moved to the right when characters are inserted, and causes charac-

ters on a line to be moved to the left as characters are deleted.

(5) Positioning Unit (PUM)

Specifies horizontal and vertical positioning parameters in units of character position.

(6) Status Reporting Transfer (SRTM)

Causes the VA 120 terminal transmit status reports, using the device status report (DSR) sequence.

(7) Tabulation Stop (TSM)

Sets TAB stops at the same column for every line on the screen.

NOT APPLICABLE

(1) Format Effector Transfer (FETM)

(2) Multiple Area Transfer (MATM)

(3) Selected Area Transfer (SATM)

(4) Vertical Editing (VEM)

TABLE 6-5 ANSI-COMPATIBLE SEQUENCES

| NAME AND MNEMONIC | SEQUENCE | FUNCTION |
|--|---|---|
| 1A. RESET MODE RM | ESC [Ps ;...; Ps l 1B 5B ** 3B 3B ** 6C | Reset one or more modes as specified by each Ps in parameter. |
| 1B. SET MODE SM | ESC [Ps ;...; Ps h 1B 5B ** 3B 3B ** 68 | Set one or more modes as specified by each Ps in parameter. |
| 2. VT52 MODE DECANM (RESET) | ESC [? 2 l 1B 5B 3F 32 6C | Reset, selects private digital sequence compatibility while in ANSI mode. In VT52 mode the terminal responds like a VT52 terminal. |
| 3A. SCROLL MODE DECSCLM (SET) | ESC [? 4 h 1B 5B 3F 34 68 | Set select smooth scrolling, causing lines to scroll at a rate of 6 lines per second |
| 3B. SCROLL MODE DECSCLM (RESET) | ESC [? 4 l 1B 5B 3F 34 6C | Reset, selects jump scrolling. Lines will be added to screen as fast as possible. |
| 4. SET TOP AND BOTTOM MARGINS DECSTBM | ESC [Pt ; Pb r 1B 5B ** 3F ** 72 | Defines scrolling region. Pt is line number of first line in scrolling region. Pb is line number of bottom line. If Pt and Pb are not selected, scrolling region is complete screen without margins. |
| 5A. ORIGIN MODE DECOM (SET) | ESC [? 6 h 1B 5B 3F 36 68 | Set, selects origin to be line 1, column 1 of scrolling region. Cursor cannot be moved outside scrolling region. |
| 5B. ORIGIN MODE DECOM (RESET) | ESC [? 6 l 1B 5B 3F 36 6C | Reset selects origin to be upper-left corner of screen regardless scrolling region. By using cursor position (CUP) or horizontal and vertical position (HVP) sequences, cursor may be moved outside scrolling region. |
| 6A. CURSOR UP CUU | ESC [Pn a 1B 5B ** 41 | Cursor moves up Pn lines, or to top, whichever is encountered first. Column unchanged. |
| 6B. CURSOR DOWN CUD | ESC [Pn b 1B 5B ** 42 | Cursor moves down Pn lines or to bottom, whichever is encountered first. Column unchanged. |

| NAME AND MNEMONIC | SEQUENCE | FUNCTION |
|--|--------------------------------------|--|
| 6C. CURSOR FORWARD CUF | ESC [Pn c 1B 5B ** 43 | Cursor moves to the right by Pn spaces or to right margin, whichever is encountered first. Same line. |
| 6D. CURSOR BACKWARD CUB | ESC [Pn d 1B 5B ** 44 | Cursor moves Pn spaces to the left or to left margin, whichever is encountered first. Same line. |
| 6E. CURSOR POSITION CUP | ESC [Pl ; Pc h 1B 5B ** 3B ** 48 | Cursor moves to line Pl, column Pc. The numbering of lines, home position and cursor movements are determined by the origin mode (DECOM) selection. If Pl=0 (or Pc=0) or not selected, cursor moves to line 1 (or column 1). |
| 6F. CURSOR POSITION CUP (HOME) | ESC [h 1B 5B 48 | Cursor moves to home position as selected by origin mode (DECOM). |
| 6G. HORIZONTAL AND VERTICAL POSITION HVP | ESC [Pn ; Pc f 1B 5B ** 3B ** 66 | Same as cursor position (CUP), see above. |
| 6H. HORIZONTAL AND VERTICAL POSITION (HOME) HVP | ESC [f 1B 5B 66 | Same as cursor position (HOME), see above. |
| 6I. INDEX IND | ESC D 1B 44 | Mover cursor down one line. Same column position. If bottom margin is encountered, a scroll up is performed. |
| 6J. REVERSE INDEX RI | ESC M 1B 4D | Cursor moves up one line. Same column position. If top margin is encountered, a scroll down is performed. |
| 6K. NEXT LINE NEL | ESC E 1B 45 | Cursor moves to start of next line, if bottom is encountered, a scroll up is performed. |

| NAME AND MNEMONIC | SEQUENCE | FUNCTION |
|--|-------------------------------|---|
| 6L. SAVE CURSOR DECSC | ESC 7 1B 37 | Terminal saves: Cursor position, character attribute (graphic rendition), character set (G0, G1, G2, or G3) and origin mode (DECOM) selection. These can be restored using restore cursor (DECRC), see below. |
| 6M. RESTORE CURSOR | ESC 8 1B 38 | Restores cursor position, etc. As saved in save cursor (DECSE), see above. If none saved, cursor moves to HOME position. |
| 7A. COLUMN MODE (SET) | ESC [? 3 h 1B 5B 3F 33 68 | Set, selects 132 columns per line. |
| 7B. COLUMN MODE (RESET) DECCOLM | ESC [? 3 l 1B 5B 3F 33 6C | Reset, selects 80 columns per line. |
| 8A. AUTO WRAP MODE (SET) DECAWM | ESC [? 7 h 1B 5B 3F 37 68 | When set, auto wrap feature is on if cursor is at right margin, any displayable character received is displayed on next line. When cursor is at end of scrolling region, a scroll up is performed. |
| 8B. AUTO WRAP MODE (RESET) | ESC [? 7 l 1B 5B 3F 37 6C | When reset, auto wrap feature is off. When cursor is at right margin, every displayable character received replaces character previously on that position. |
| 9A. SCREEN MODE (SET) DECSUNM | ESC [? 5 h 1B 5B 3F 35 68 | When set, selects reverse screen. The characters are dark characters shown on a white screen background. |
| 9B. SCREEN MODE (RESET) DECSCUM | ESC [? 5 l 1B 5B 3F 35 6C | When reset, selects normal screen. White characters are shown on a dark screen background. |
| 10A. LINE FEED/ NEW LINE MODE (SET) LNM | ESC [2 0 h 1B 5B 32 30 68 | Also called "NEW LINE OPTION". When set, cursor will move to first column of next line, whenever a LINE FEED, or VERTICAL TAB CHARACTER is received. The RETURN key generates both a carriage return and a line feed. |

| | NAME AND MNEMONIC | SEQUENCE | FUNCTION |
|------|--|-------------------------------|--|
| 10B. | LINE FEED NEW LINE MODE | ESC [2 0 1 1B 5B 32 30 6C | When reset, the cursor will move down one line in the current column, when a LINE FEED, FORM FEED, or VERTICAL TAB CHARACTER is received. The return key generates a carriage return only. |
| 11A. | KEY BOARD ACTION MODE (SET) KAM | ESC [2 h 1B 5B 32 68 | When set, keyboard is turned off. KBD LOCKED indicator lights on. |
| 11B. | KEYBOARD ACTION MODE (RESET) KAM | ESC [2 1 1B 5B 32 6C | When reset, the keyboard is on and KBD locked indicator is off. |
| 12A. | AUTO REPEAT MODE (SET) DECARM | ESC [? 8 h 1B 5B 3F 38 68 | When set, auto repeat feature is on: a key pressed for longer than ½ second causes an automatic repeat of the character. |
| 12B. | AUTO REPEAT MODE (RESET) DECARM | ESC [? 8 1 1B 5B 3F 38 6C | When reset, auto repeat feature is off: keys do not automatically repeat. |
| 13A. | SEND— RECEIVE MODE (SET) SRM | ESC [1 2 h 1B 5B 31 32 68 | When set, local echo feature is off. Characters are transmitted to computer only. Only characters echoed back from the computer are displayed on screen. |
| 13B. | SEND— RECEIVE MODE (RESET) SRM | ESC [1 2 1 1B 5B 31 32 6C | When reset, local echo feature is on. Character transmitted to computer are also shown on screen. |
| 14A. | CURSOR KEY MODE (SET) | ESC [? 1 h 1B 5B 3F 31 68 | When set, cursor keys generate control functions. |
| 14B. | CURSOR KEY MODE (RESET) DECCKM | ESC [? 1 1 1B 5B 3F 31 6C | When reset, cursor keys generate ANSI cursor control sequences. |
| 15A. | ALTERNATE APPLICATION KEYPAD MODE DECKPAM | ESC = 1B 3D | Used to select alternate (application) keypad mode: Auxiliary keypad generates control functions. |

| NAME AND MNEMONIC | | SEQUENCE | FUNCTION |
|----------------------|------------------------------------|---------------------|--|
| 15B. | NUMERIC KEYPAD MODE DECKPNM | ESC > 1B 3E | Used to select numeric keypad mode: Auxiliary keypad generates the same numeric characters and comma, period, and minus of main keyboard keys. Generate ANSI cursor control sequences only. |
| 16A. | SELECT CHARACTER SET SCS | ESC (A 1B 28 41 | Selects the U.K. character set as G0. |
| 16B. | SELECT CHARACTER SET SCS | ESC (B 1B 28 42 | Selects the U.S. character set as G0. |
| 16C. | SELECT CHARACTER SET. | ESC (0 1B 28 30 | Selects the special character and line drawing character as G0. |
| 16D. | SELECT CHARACTER SET SCS | ESC (1 1B 28 31 | Selects the alternate EPROM character set as G0. |
| 16E. | SELECT CHARACTER SET SCS | ESC (2 1B 28 32 | Selects the alternate EPROM special characters character set as G0. |
| 16F. | SELECT CHARACTERS SET SCS | ESC) A 1B 29 41 | Selects the U.K. character set as G1. |
| 16G. | SELECT CHARACTER SET SCS | ESC) B 1B 29 42 | Selects the U.S. character set as G1. |
| 16H. | SELECT CHARACTER SET | ESC) 0 1B 29 30 | Selects the special character and line drawing character set as G1. |

| NAME AND MNEMONIC | | SEQUENCE | FUNCTION |
|----------------------|---------------------------------------|--------------------------|---|
| 16I. | SELECT CHARACTER SET SCS | ESC) 1 1B 29 31 | Selects the alternate EPROM character set as G1. |
| 16J. | SELECT CHARACTER SET | ESC) 2 1B 29 32 | Selects the alternate EPROM special characters character set as G1. |
| 16K. | SINGLE SHIFT 2 SS2 | ESC N 1B 4E | Selects the G2 character set for one character. (G2 character set is the character set selected in SET-UP) |
| 16L. | SINGLE SHIFT 3 SS3 | ESC O 1B 4F | Selects the G3 character set for one character. (G3 character set is the character set selected in SET-UP). |
| 17A. | SELECT GRAPHIC RENDITION SGR | ESC [m 1B 5B 6D | All character attributes off. |
| 17B. | SELECT GRAPHIC RENDITION SGR | ESC [0 m 1B 5B 30 6D | All character attributes off. |
| 17C. | SELECT GRAPHIC RENDITION SGR | ESC [1 m 1B 5B 31 6D | Selects bold character attribute (high intensity). |
| 17D. | SELECT GRAPHIC RENDITION SGR | ESC [4 m 1B 5B 34 6D | Selects underline character attribute. |
| 17E. | SELECT GRAPHIC RENDITION SGR | ESC [5 m 1B 5B 35 6D | Selects blink character attribute. |

| NAME AND MNEMONIC | | SEQUENCE | FUNCTION |
|----------------------|--|--------------------------|--|
| 17F. | SELECT GRAPHIC RENDITION SGR | ESC [7 m 1B 5B 37 6D | Selects reverse video character attribute. |
| 18A. | HORIZONTAL TABULATION SET HTS | ESC H 1B 48 | Used to set a horizontal tab stop at the cursor position. |
| 18B. | TABULATION CLEAR TBC | ESC [g 1B 5B 67 | Used to clear a horizontal tab stop at the cursor position. |
| 18C. | TABULATION CLEAR TBC | ESC [0 g 1B 5B 30 67 | Used to clear a horizontal tab stop at the cursor position. |
| 18D. | TABULATION CLEAR TBC | ESC [3 g 1B 5B 33 67 | Used to clear all horizontal tab stops. |
| 19A. | DOUBLE HEIGHT/WIDTH (TOP HALF) DECDHL | ESC # 3 1B 23 33 | Used to make the line at the cursor position the top half of a double height, double width line. The sequences must be used in pairs on adjacent lines and the same character must be displayed on both lines to form full characters. If the line was single-Height, single-Width, characters to the right half of the screen are lost. |
| | DOUBLE HEIGHT/WIDTH (BOTTOM HALF) | ESC # 4 1B 23 34 | |
| 19B. | SINGLE WIDTH LINE DECSWL | ESC # 5 1B 23 35 | Used to make the cursor line single width, single height. |
| 19C. | DOUBLE WIDTH LINE DECDWL | ESC # 6 1B 23 36 | Used to make the cursor line double width, single height. If the line was single width, single height, all characters on the right half of the screen are lost. |
| 20A. | ERASE IN LINE EL | ESC [K 1B 5B 4B | Erases the line from the cursor position to its end including the cursor position. |
| 20B. | ERASE IN LINE EL | ESC [0 K 1B 5B 30 4B | Same as above. |

| | NAME AND MNEMONIC | SEQUENCE | FUNCTION |
|------|----------------------------|---------------------------|--|
| 20C. | ERASE IN LINE EL | ESC [1 K 1B 5B 31 4B | Erases the line from the start of cursor line to the cursor including the cursor position. |
| 20D. | ERASE IN LINE EL | ESC [2 K 1B 5B 31 4B | Erases the cursor line. |
| 20E. | ERASE IN DISPLAY ED | ESC [J 1B 5B 4A | Erases from the cursor position to the end of the screen, including cursor position. |
| 20F. | ERASE IN DISPLAY ED | ESC [0 J 1B 5B 30 4A | Same as above. |
| 20G. | ERASE IN DISPLAY ED | ESC [1 J 1B 5B 31 4A | Erases from start of the screen to cursor including cursor position. |
| 20H. | ERASE IN DISPLAY ED | ESC [2 J 1B 5B 32 4A | Erases all of the display, all lines erased. The cursor remains in same position. All lines are changed to single width. |
| 21A. | DELETE CHARACTER DCH | ESC [Pn P 1B 5B ** 50 | Pn characters are deleted starting from the cursor position. All characters to the right of the cursor move one space to the left and a space character is inserted at the right margin. (The space character has no character attributes). Characters moved when using this sequence are bounded by end of line or protected field (when in edit mode, and erasure mode reset). Characters in protected fields cannot be deleted through this procedure. If the cursor is in a protected field while erasure mode is reset, the sequence will be ignored. Characters in protected fields also cannot be shifted left by this procedure. |
| 21B. | INSERT LINE IL | ESC [Pn L 1B 5B ** 4C | Pn lines are inserted from the cursor position downwards, including the line at the cursor position. All lines below the cursor are moved down Pn lines, and lines (which move below the bottom margin) or protected fields are lost, if in edit mode and erasure mode is reset. When the cursor is outside the scrolling region, this sequence is ignored. |

| NAME AND MNEMONIC | | SEQUENCE | | | | FUNCTION | |
|----------------------|--|----------|----|----|----|----------|---|
| 21C. | DELETE LINE DL | ESC | [| Pn | M | | |
| | | 1B | 5B | ** | 4D | | Pn lines are deleted starting from the cursor downwards, lines below the lines deleted move up. New line is added to the bottom of the screen. These lines have no line or character attributes. Lines in protected fields cannot be deleted nor moved by this procedure, if in edit mode with erasure mode reset (in this case lines will be added above the next protected field). When the cursor is outside the scrolling region, this sequence is ignored. |
| 22A. | INSERTION REPLACEMENT MODE (SET) | ESC | [| 4 | h | | |
| | | 1B | 5B | 34 | 68 | | When set, insertion mode is selected. Characters may be added to a line without erasing previous characters. When a character is added, all characters to the right of the cursor move to the right. Characters which are moved past the right margin are lost. When set, the insert keyboard indicator is on. |
| 22B. | INSERTION REPLACEMENT MODE (RESET) IRM | ESC | [| 4 | l | | |
| | | 1B | 5B | 34 | 68 | | When reset, replacement mode is selected. New characters added to a line will replace the characters previously at that position. The character previously at the cursor position is lost. When reset, insert keyboard indicator is off. |
| 23A. | EDITING MODE (SET) DECEDM | ESC | [| ? | 1 | 0 | h |
| | | 1B | 5B | 3F | 31 | 30 | 68 |
| 23B. | EDITING MODE (RESET) DECEDM | ESC | [| ? | 1 | 0 | l |
| | | 1B | 5B | 3F | 31 | 30 | 6C |
| 24A. | EDIT KEY EXECUTION (SET) DECEKEM | ESC | [| ? | 1 | 6 | h |
| | | 1B | 5B | 3F | 31 | 36 | 68 |
| 24B. | EDIT KEY EXECUTION MODE (RESET) DECEKEM | ESC | [| ? | 1 | 6 | l |
| | | 1B | 5B | 3F | 31 | 36 | 6C |
| | | | | | | | When reset, shift and edit key sequence has a deferred response. Terminal transmits an edit mode (DECEDM) sequence, which in turn requests the computer to transmit an echoed DECEDM sequence back to the terminal, and switch between the interactive and edit modes. |

| NAME AND MNEMONIC | | SEQUENCE | FUNCTION |
|----------------------|--|------------------------------------|---|
| 25A. | PROTECTED FIELD ATTRIBUTES DECPRO | ESC [0 } 1B 5B 30 7D | Used to select no protection attributes. |
| 25B. | PROTECTED FIELD DECPRO | ESC [1 } 1B 5B 30 7D | Used to select bold protection attribute. |
| 25C. | PROTECTED FIELD DECPRO | ESC [4 } 1B 5B 34 7D | Used to select underline protection attribute. |
| 25D. | PROTECTED FIELD ATTRIBUTES DECPRO | ESC [5 } | Used to select blink protection attribute. |
| 25E. | PROTECTED FIELD ATTRIBUTES DECPRO | ESC [7 } 1B 5B 37 7D | Used to select reverse video attribute. |
| 25F. | PROTECTED FIELD ATTRIBUTES DECPRO | ESC [2 5 4 } 1B 5B 32 35 34 7D | Used to select all attributes off protection. |
| 26A. | ERASURE MODE (SET) ERM | ESC [6 h 1B 5B 36 68 | When set, characters in both protected and unprotected fields may be erased using the erased line (EL) and erase in display (ED) sequences. |
| 26B. | ERASURE MODE (RESET) ERM | ESC [6 l 1B 5B 36 6C | When reset, only characters in unprotected fields may be erased by EL and ED sequences. |
| 27A. | TRANSMIT EXECUTION (SET) DECTEM | ESC [? 1 4 h 1B 5B 3F 31 34 68 | When set, character transmission begins immediately after ENTER key is pressed, or after RETURN key is pressed if DECLTM is set. |

| | NAME AND MNEMONIC | SEQUENCE | FUNCTION |
|------|--|------------------------------------|--|
| 27B. | TRANSMIT EXECUTION (RESET) DECTEM | ESC [? 1 4 1 1B 5B 3F 31 34 6C | When reset, pressing the ENTER key causes a delayed transmission of characters. In this case the terminal first sends a set transmit state (STS) signal to the computer, informing the computer that transmission is desired. The transmission does not take place until a transmit (DECXMIT) sequence is received from the computer. |
| 28. | SET TRANSMIT STATE STS | ESC S 1B 53 | This sequence is transmit to computer to request character block transmission. |
| 29. | TRANSMIT MODE DECXMIT | ESC 5 1B 35 | This sequence causes a character block transmission from the terminal. |
| 30A. | LINE TRANSMIT (SET) DECLTM | ESC [? 1 1 h 1B 5B 3F 31 31 68 | Used to select line transmit mode transmission: The terminal transmits characters from the beginning of the first unprotected field (cursor also moved) of cursor line. When the LINE FEED/NEW LINE (LNM) is set, the cursor will then move to first unprotected field of the next line. If the end of the scrolling region has been reached, the cursor will move to the first unprotected field of the current line. |
| 30B. | LINE TRANSMIT (RESET) DECLTM | ESC [? 1 1 1 1B 5B 3F 31 31 6C | When reset, a full page or a partial page transfer may be selected by the transfer termination mode (TTM) selection. |
| 31A. | TRANSFER TERMINATION MODE (SET) TTM | ESC [1 6 h 1B 5B 31 36 68 | When set, the terminal transmits full page: entire scrolling region is transmitted. |
| 31B. | TRANSFER TERMINATION MODE (RESET) TTM | ESC [1 6 1 1B 5B 31 36 6C | When reset, partial page transmission is selected: a portion of the scrolling region between the cursor and the partial page marker is transmitted. If the marker is not selected or is placed after the cursor, the terminal will use the beginning of the scrolling region as a marker. The partial page marker is in the display memory and not displayed on the screen. |

| | NAME AND MNEMONIC | SEQUENCE | FUNCTION |
|------|--|------------------------------------|--|
| 32A. | SPACE COMPRESSION/ FIELD DELIMITER MODE (SET) DECSFDM | ESC [? 1 3 h 1B 5B 3F 31 33 68 | When set, space characters on the ends of fields are not transmitted. Transmitted fields end with a single record separator character, except the last field on a line, which ends when line character selected by the LINE FEED/NEW LINE (LNM) feature ends. |
| 32B. | SPACE COMPRESSION/ FIELD DELIMITER MODE (RESET) DECSFDM | ESC [? 1 3 I 1B 5B 3F 31 33 6C | When reset, characters are transmitted as they are displayed on the video screen. |
| 33A. | GUARDED AREA TRANSMIT MODE (SET) GATM | ESC [1 h 1B 5B 31 68 | When set, all characters are transmitted, protection attributes do not affect transmission. |
| 33B. | GUARDED AREA TRANSMIT MODE (RESET) GATM | ESC [1 I 1B 5B 31 6C | When reset, characters in protected fields are not transmitted. In transmission to the computer, these fields are replaced by the record separator character, and in transmission of printing, they are replaced by space characters. Only characters in unprotected fields are transmitted. |
| 34A. | TRANSFER TERMINATION CHARACTER DECTTC | ESC [0 1 1B 5B 30 7C | Used to select function disabled, no end of block character. |
| 34B. | TRANSFER TERMINATION CHARACTER DECTTC | ESC [1 1 1B 5B 31 7C | FORM FEED (FF, HEX 0C) is selected as the end of block character. |
| 34C. | TRANSFER TERMINATION CHARACTER DECTTC | ESC [2 1 1B 5B 33 7C | End of text (ETX, HEX 03) is selected as end of block character. |

| | NAME AND MNEMONIC | SEQUENCE | FUNCTION |
|------|---|-------------------------------|--|
| 34D. | TRANSMIT TERMINATION CHARACTER DECTTC | ESC [3 1 1B 5B 34 7C | End of transmission (EOT, HEX 04) is selected as end of block character. |
| 34E. | TRANSMIT TERMINATION CHARACTER DECTTC | ESC [4 1 1B 5B 34 7C | Carriage return (CR, HEX 0D) is selected as end of block character. |
| 35A. | MEDIA COPY (AUTO PRINT ON) MC | ESC [? 5 i 1B 5B 3F 35 69 | Used to turn on the auto print operation. The line exited by the cursor is printed. (Auto print is not performed in edit mode, but may be switched on and off at any time.) The cursor is moved from line to line by the line feed (LF, 0C HEX CODE), or the form feed (FF, 0C HEX CODE), or the vertical tab (VT, 0B HEX CODE) control characters. The above control character is also transmitted to the printer. This also functions in an auto wrap, in which case the line is ended with CR, LF control characters. |
| 35B. | MEDIA COPY (AUTO PRINT OFF) MC | ESC [? 4 i 1B 5B 3F 34 69 | Used to turn off the auto print operation. |
| 35C. | MEDIA COPY (PRINTER CONTROLLER ON) MC | ESC [5 i 1B 5B 35 69 | Used to turn on printer controller operation. Characters received from computer are not displayed on the screen, but printed by the serial printer. Insertion and deletion of spaces, line delimiting and selection of character sets are not performed by the terminal. |
| 35D. | MEDIA COPY (PRINTER CONTROLLER OFF) MC | ESC [4 i 1B 5B 34 69 | Used to turn off the printer controller operation. It is necessary to move the printhead to the left margin before leaving the printer controller. |
| 35E. | MEDIA COPY (PRINT CURSOR LINE) MC | ESC [? 1 i 1B 5B 3F 31 69 | Used to print only the cursor line The cursor is not moved. |

| NAME AND MNEMONIC | SEQUENCE | FUNCTION |
|--|------------------------------------|---|
| 35F MEDIA COPY (PRINT SCREEN) MC | ESC [i 1B 5B 69 | Used to print the complete screen or scrolling region, depending on the print extent (DECPEX). |
| 35G. MEDIA COPY (PRINT SCREEN) MC | ESC [0 i 1B 5B 30 69 | Same as media copy (print screen), see above. |
| 36A. PRINTER EXTENT MODE (SET) DECPEX | ESC [? 1 9 h 1B 5B 3F 31 39 68 | When set, a print screen operation will cause entire screen to be printed. |
| 36B. PRINTER EXTENT MODE (RESET) DECPEX | ESC [? 1 9 l 1B 5B 3F 31 39 6C | When reset, a print screen operation causes only the scrolling region to be printed. |
| 37A. PRINTER FORM FEED MODE (SET) DECPFF | ESC [? 1 8 h 1B 5B 3F 31 38 68 | When set, the form feed character is selected as the print termination character (and transmitted to the printer at the end of a print screen operation). |
| 37B. PRINTER FORM FEED MODE (RESET) DECPFF | ESC [? 1 8 l 1B 5B 3F 31 38 6C | When reset, the selection is for no print termination character. |
| 38A. DEVICE STATUS REPORT (COMPUTER) DSR | ESC [5 n 1B 5B 35 6E | The computer uses a DSR sequence to request a status report. |
| 38B. DEVICE STATUS REPORT (TERMINAL) DSR | ESC [0 n 1B 5B 30 6E | This sequence is the terminal's response that no errors are found by selftest. |

| NAME AND MNEMONIC | | SEQUENCE | | | | | | FUNCTION |
|----------------------|---|----------|----|----|----|----|----|--|
| 38C. | DEVICE STATUS REPORT (TERMINAL) DSR | ESC | [| 3 | n | | | This sequence is the terminal's response that self-test has detected a malfunction error. |
| | | 1B | 5B | 33 | 6E | | | |
| 38D. | DEVICE STATUS REPORT (COMPUTER) DSR | ESC | [| ? | 1 | 5 | n | Used before selecting a print operation. The computer requests a status report on the printer, which is performed by the terminal. |
| | | 1B | 5B | 3F | 31 | 35 | 6E | |
| 38E. | DEVICE STATUS REPORT (PRINTER) DSR | ESC | [| ? | 1 | 3 | n | This sequence indicates that no data terminal ready (DTR) signal has been received from the printer since the terminal has powered up. No printer is connected. |
| | | 1B | 5B | 3F | 31 | 33 | 6E | |
| 38F. | DEVICE STATUS REPORT (PRINTER) DSR | ESC | [| ? | 1 | 1 | n | DTR has been received; however it is now off, indicating that the printer is not ready to print. |
| | | 1B | 5B | 3F | 31 | 31 | 6E | |
| 38G. | DEVICE STATUS REPORT (PRINTER) DSR | ESC | [| ? | 1 | 0 | n | DTR signal is received from the printer. Printer is ready. |
| | | 1B | 5B | 3F | 31 | 30 | 6E | |
| 38H. | DEVICE STATUS REPORT (COMPUTER) DSR | ESC | [| 6 | n | | | Requests terminal to report cursor position using cursor report sequence (CPR). |
| | | 1B | 5B | 36 | 6E | | | |
| 38I. | CURSOR POSITION REPORT (TERMINAL) CPR | ESC | [| Pl | ? | Pc | R | The CPR sequence is the terminal response to a DSR request from the computer. Terminal reports that the cursor is in line Pl, column Pc. In default condition with no parameters present or with parameters of 1, cursor is at Home. (Number of line determined by ORIGIN mode (DECOM) selection.) |
| | | 1B | 5B | ** | 3B | ** | 52 | |

| NAME AND MNEMONIC | | SEQUENCE | FUNCTION |
|----------------------|---|-------------------------------|---|
| 38J. | DEVICE ATTRIBUTES (COMPUTER) DA | ESC [c 1B 5B 63 | This sequence is used by the computer to request that the terminal identifies itself by sending a terminal DA sequence. |
| 38K. | DEVICE ATTRIBUTES (COMPUTER) DA | ESC [0 c 1B 5B 30 63 | Same as device attributes (computer) above. |
| 38I. | IDENTIFY TERMINAL (COMPUTER) DECID | ESC Z 1B 5A | Same as device attributes, however, DA is preferred. |
| 38M. | DEVICE ATTRIBUTES (TERMINAL) DA | ESC [? 7 c 1B 5B 3F 37 63 | This is the terminal's response to a computer DA request. |
| 39. | RESET TO INITIAL STATE RIS | ESC c 1B 63 | Used to reset the terminal to initial state. |

Explanations on Table 6-5

Key: * Indicates one or more ASCII characters or variable numeric parameters in the HEX representation of the sequence.

Ps Indicates a variable selective parameter. Each parameter in the sequence represents a mode. The parameter is transmitted to the computer using ASCII characters. A list of parameters (Ps) is in Table 6-5 for ANSI specified modes and Table 6-6 for ANSI compatible private modes respectively.

; Is used to separate modes when setting several modes with a single sequence (SM or RM) (; HEX 3B)

? Is used as the first character in a parameter string when changing ANSI compatible private mode parameters. (?, HEX 3F) All parameters contained in the sequence are interpreted as ANSI compatible private parameters defined by DIGITAL. See Table 6-6 for list of compatible private modes.

Pt Represents variable numeric parameters. These parameters are decimal numbers transmitted to the terminal as ASCII characters.

Pb Same as Pt

Pn Represents a variable numeric parameter, (decimal number). If no parameter or a

parameter of 0 is selected, the terminal assumes the parameter to equal 1.

- Pl Indicates numeric parameter within a sequence. (See Pt above.)
- Pc Same as Pl
- h After a sequence indicates mode set.
- l After a sequence indicates sequence is reset.

Table 6-5, #1 A/B

A general sequence for variable selective parameter selection. Each parameter (Ps) in these sequences indicates a mode, transmitted from the terminal to the computer using ASCII characters. Several modes may be set in a sequence by using the semicolon (;, 3B HEX) as a separator. Table 6-6 lists the selective parameters for both ANSI specified modes, and ANSI compatible private modes. Ps represents the selective parameters. Mnemonics of ANSI private modes are preceded in all cases by the characters DEC. More specific uses of these modes are given later in this Chapter, and Table 6-5 has provided detailed instruction as to their use.

Table 6-5 #2: ANSI/VT 52 Compatibility. (VT 52 Mode)

When in VT 52 mode, features and modes selected while in ANSI mode are still in use. However, they usually cannot be altered in VT 52. When the terminal is in ANSI mode, the sequence ESC [? 2 l selects VT 52 mode, compatible with DIGITAL sequences.

Table 6-5 #3A/B Scrolling

The scrolling operation adds spaces for new lines of characters in scrolling region by moving the existing lines upward or downward. Use sequence as item 3A for smooth scroll and item 3B for jump scroll.

Unless the AUTO XON/XOFF SET-UP feature control characters are used, characters may be lost

when using smooth scroll. When XON/XOFF control characters are not used, fill characters are needed.

Table 6-5 #4: Scrolling Region

The scrolling region is set by the top and bottom margins, which are given in the sequence as parameters. Pt (parameter for top margin) is less than Pb (parameter for bottom margin). When a power up or a reset is performed, the scrolling region is defined as the complete screen. When a scrolling operation is performed, only the lines in the scrolling region move.

Selecting margins causes the cursor to move to the HOME position, as determined by the origin mode (DECOM) feature selection.

Table 6-5 #5A/B Origin. (HOME)

Selects a HOME position on the screen. HOME (ORIGIN) position is defined as line 1, column 1. Line numbers always starts from ORIGIN (HOME).

When the origin is inside the scrolling region, the cursor cannot be moved outside the region. If the origin is at the top left corner of the screen, the cursor position (CUP) and horizontal and vertical position sequences (HVP) can move the cursor outside the margins.

When the ORIGIN is changed, the cursor moves to the new ORIGIN. When a power up or reset is performed, the origin mode is reset (ORIGIN defined as top left corner.)

Table 6-5 #6A/M Cursor Positioning

The cursor defines the active position on the screen, where the next character will be displayed. The cursor automatically moves one space to the right when a character is added. It can also be moved by the following control characters:

Line feed (LF, 04 HEX CODE) —

Moves cursor down one line

Form feed (FF, 0C HEX CODE) —

Moves cursor down one line

Vertical Tab (VT, 0B) —

Moves cursor down one line

Line feed/new line (LNM) —

Moves cursor down one line and to left margin.

Carriage return (CR, 0D) —

Moves cursor to left margin

Backspace (BS, 08) —

Moves cursor one space to the left

Horizontal Tab character (HT, 09) —

Moves cursor to the next Tab stop or right margin, if no Tabs are set. If erasure mode (ERM) resets and edit mode (DECEDM) is selected, cursor moves to next Tab stop or to beginning of next unprotected field.

The cursor moves to the home position when scrolling region (DECSTBM) or the origin mode (DECOM) selection is changed.

Table 6-5 #7A/B Columns Per Line

This feature selects the number of columns per line to be either 80 or 132 columns.

When this feature is changed, the screen is cleared and the full screen is defined as scrolling region.

Table 6-5 #8A/B Auto Wrap

Selects where the cursor will be placed after reaching the right margin. The cursor may either remain at the margin or automatically move to the next line. Auto wrap does not apply to Tab characters. Tab characters never move the cursor to the next line.

Table 6-5 #9A/B Screen Background

This feature selects either light or a dark display background.

Table 6-5 #10A/B Line Feed/New Line

This feature is used to select which control characters are generated by the RETURN key. Also, this feature determines the terminal's response to a number of control characters listed below. When half duplex communication with coded control is selected, the carriage return character can also be a turnaround character. (See Chapter 7)

The RETURN key transmits a carriage return (CR) character when this feature is off. If this feature is on, the RETURN key transmits both a carriage return and a line feed (LF) character.

The LINE FEED key transmits a single line feed character no matter this feature is on or off.

When this (line feed/new line) feature is off, line feed (LF), form feed (FF), or vertical Tab (VT) characters are received as line feed characters, causing cursor to move one line down in same column. When this feature is on, LF, FF, or VT are interpreted as carriage return and line feed, moving the cursor to the start of next line.

The Carriage Return (CR) character is interpreted as a CR only, no matter this feature is on or off. CR moves the cursor to the left margin.

Table 6-5 #11A/B Keyboard Action (FDX)

Can be used only in full duplex communication and not in half duplex communication. This feature makes it possible for the keyboard to be turned on and off by the computer. When SET-UP is entered, this feature is reset.

Table 6-5 #12A/B Auto Repeat

This mode selects for auto repeat, which, when set can cause a character to be repeated when the key is pressed for more than 1/2 second. The character will repeat at a rate of 20 characters per second. Only the SET-UP, ESC, RETURN, ENTER, NO SCROLL, and CTRL keys are not affected by this feature. When reset, auto repeat does not function.

Table 6-5 #13A/B Local Echo

When the local Echo (send-receive mode) is on, characters transmitted by the terminal are automatically displayed on its screen. When the local Echo is off, the computer must echo characters back to the terminal before they are displayed.

Table 6-5 #14A/B Cursor Key Character Selection

This feature is used to select the character set generated by cursor keys if the alternated (application) keypad mode (DECKPAM) is selected. Cursor key mode selects the set of characters transmitted by the cursor keys. If the numeric keypad mode (DECKPNM) is selected, this feature is reset and cannot be changed. Set and reset character sequences are listed below.

When a power up or reset is performed, the cursor key mode will reset. When there is a communication line connection performed, the cursor key mode will also reset, unless full duplex no modem control (FDXA) is used. (See Chapter 7)

When cursor key mode is RESET, cursor keys generate character sets as follows:

| | | | |
|----------------|-----|----|----|
| CURSOR UP — | ESC | [| A |
| | 1B | 5B | 41 |
| CURSOR DOWN — | ESC | [| B |
| | 1B | 5B | 42 |
| CURSOR RIGHT — | ESC | [| C |
| | 1B | 5B | 43 |
| CURSOR LEFT — | ESC | [| D |
| | 1B | 5B | 44 |

When cursor key mode is set, cursor keys generate character sets as follows:

| | | | |
|----------------|-----|----|----|
| CURSOR UP — | ESC | O | A |
| | 1B | 4F | 41 |
| CURSOR DOWN — | ESC | O | B |
| | 1B | 4F | 42 |
| CURSOR RIGHT — | ESC | O | C |
| | 1B | 4F | 43 |
| CURSOR LEFT — | ESC | O | D |
| | 1B | 4F | 44 |

Table 6-5 #15A/B Keypad Character Selection

This mode determines the characters generated by the auxiliary keypad, depending on the selection of either alternate or numeric keypad mode, as seen in the list Table 6-6.

TABLE 6-6 ANSI KEYPAD CODES

| NUMERIC KEYPAD MODE: | | KEY | CHARACTER GENERATED | | HEX | CODE | |
|----------------------|--|------------|---------------------|-----|-----|------|--------|
| | | 0 | | 0 | 30 | | |
| | | 1 | | 1 | 31 | | |
| | | 2 | | 2 | 32 | | |
| | | 3 | | 3 | 33 | | |
| | | 4 | | 4 | 34 | | |
| | | 5 | | 5 | 35 | | |
| | | 6 | | 6 | 36 | | |
| | | 7 | | 7 | 37 | | |
| | | 8 | | 8 | 38 | | |
| | | 9 | | 9 | 39 | | |
| | | — (MINUS) | | — | 2D | | |
| | | , (COMMA) | | , | 2C | | |
| | | . (PERIOD) | | . | 2E | | |
| | | ENTER (see | CR | | 0D | | |
| | | NOTE) or | | | | | |
| | | | CR | AND | LF | 0D | AND 0A |
| | | PF1 | ESC | O | P | 1B | 4F 50 |
| | | PF2 | ESC | O | Q | 1B | 4F 51 |
| | | PF3 | ESC | O | R | 1B | 4F 52 |
| | | PF4 | ESC | O | S | 1B | 4F 53 |

NOTE: When numeric keypad is selected, the **ENTER** key generates the same characters as the **RETURN** key. When the **LINE FEED/NEW LINE** feature is off, only a carriage return (CR) control character is generated. When on, both the carriage return (CR) and the line feed (LF) control characters are generated.

| ALTERNATE KEYPAD MODE: | | KEY | CHARACTERS GENERATED | | HEX | CODE | |
|------------------------|--|------------|----------------------|---|-----|------|-------|
| | | 0 | ESC | O | p | 1B | 4F 70 |
| | | 1 | ESC | O | q | 1B | 4F 71 |
| | | 2 | ESC | O | r | 1B | 4F 72 |
| | | 3 | ESC | O | s | 1B | 4F 73 |
| | | 4 | ESC | O | t | 1B | 4F 74 |
| | | 5 | ESC | O | u | 1B | 4F 75 |
| | | 6 | ESC | O | v | 1B | 4F 76 |
| | | 7 | ESC | O | w | 1B | 4F 77 |
| | | 8 | ESC | O | x | 1B | 4F 78 |
| | | 9 | ESC | O | y | 1B | 4F 79 |
| | | — (MINUS) | ESC | O | m | 1B | 4F 6D |
| | | , (COMMA) | ESC | O | l | 1B | 4F 6C |
| | | . (PERIOD) | ESC | O | n | 1B | 4F 6E |
| | | ENTER | ESC | O | M | 1B | 4F 4D |
| | | PF1 | ESC | O | P | 1B | 4F 50 |
| | | PF2 | ESC | O | Q | 1B | 4F 51 |
| | | PF3 | ESC | O | R | 1B | 4F 52 |
| | | PF4 | ESC | O | S | 1B | 4F 53 |

When codes are echoed back to the terminal in ANSI mode, or if the terminal is off-line, screen will display the last character of the sequence. For example, PF1 sequence ESC O P is displayed as "P".

Table 6-5 #16A/L Character Sets and Selection

The VA 120 terminal can select from five different characters sets: U.S. character set, U.K. character set, special characters and line drawing character set (VT 100 compatible), alternate ROM character set, and alternate ROM special character set. The U.S. and U.K. character sets meet the "ISO international register of character sets to be used with ESCAPE sequences." The US/UK character set, and special character and line drawing character set are shown in Table 6-7, 6-8 respectively. In all, the VA 120 can select a total of 254 characters for display use. Any two character sets can be selected as active. They are defined as G0 and G1 by the computer using select character set (SCS) sequence. In such case. Using SHIFT IN (SI, HEX 0F) control character will invoke G0 character set, while using SHIFT OUT (SO, HEX 0E) sequence will invoke G1.

To select G0 or G1, follow sequences as item 16A through 16J. VA 120 terminal has also G2 and G3 character sets, selected in SET-UP. However they can be selected for one character set each time. To select a second character SET, use the sequence again; otherwise, the previous character set will be returned.

In block transmission, the VA 120 terminal attempts to select the correct character set using following rules:

- (1) At the start of transmission the G0 character set of VA 120 is assumed as same as the receiving device. (Printer or computer) if the character to be transmitted is not in the presently selected G0, the terminal will search the character set in the order of US/UK in SET-UP, US/UK, special characters and line drawing character set.
- (2) In process of transmission, if the next character is not the G0 character set, G0 will be changed. G1 is never changed.
- (3) At the end of transmission, if the G0 character set of the computer or printer is different from the beginning of transmission, the G0 is changed and a G0 designator is transmitted to select the correct one; G0 is transmitted before the printer termination or end of block transmission.

The screen may display and transmit a substitute (SUB, HEX 1A) character when it has received a parity error, the SUB or CAN control character, and the ■ character in the special character and line drawing character set.

Table 6-5 #17A/F Character Attributed

Adjacent characters with the same character attributes are defined as a field. Field boundaries are set at the position where attributes changed.

This terminal can select the following character attributes:

Bold
Underline
Blink
Reverse Video

Any combination of the above may be selected simultaneously. When an attribute is selected, all characters received by the terminal will be displayed with that attribute. If a scroll is performed, the attributes also move with the characters.

Table 6-5 #18A/D Tab Stops

This feature sets and clears Tab stops on the screen. Tab stops are positions on the lines where the cursor will stop when a horizontal Tab (HT, 09 HEX CODE) character is received. If no Tab stops are set, HT moves the cursor to the right margin of the current line.

Table 6-5 #19A/D Line Attributes

This feature selects attributes for the whole cursor lines on the screen. When an attribute is changed, the cursor remains in the same place unless the new attribute moves its position past the right margin, in which case the cursor stops at the right margin. When a scroll is performed, the attribute moves with the line. When a line is erased using the erase in display (ED) sequence, the line becomes single height, single width.

Table 6-5 #20A/H Erasing

When characters are erased, they are lost, and their character attributes lost as well (except when a line is erased using the erase in line (EL) sequence, in

which case the line keeps its attributes.) Erase in display (ED) will cause the line erased to change to single height, single width.

The cursor stays at the same position when an erase is performed.

Erasure mode (ERN) determines whether protected characters can be erased by EL or ED sequences. (See erasure mode, Table 6-5 #26A, 26B)

Table 6-5 #21A/C Computer Editing

This feature determines whether the computer may perform line or character inserting and deleting functions. Characters or lines are deleted from the cursor position, and the cursor does not move. Adding characters on the screen is performed according to the insertion-placement mode (IRM) selection (See IRM in this Chapter)

Delete character (DCH), insert line (IL), and delete line sequences may or may not affect protected areas when in edit mode (DECEDM), depending on the erasure mode (ERM) selection. (See ERM in this Chapter)

Table 6-5 #22A/B Character Insertion-Replacement

This feature selects between two methods of adding characters on the screen:

1. Characters replace character previously at cursor position.
2. Characters are inserted at cursor position, and all other characters on line, including that at cursor position, move one space to the right.

When a communication line connection is performed, this feature is reset unless in Full Duplex no modem control (FDX A.) (See Chapter 7.)

Table 6-5 #23A/B Local Editing (Edit Mode)

This feature selects whether the terminal functions

as an interactive or a local editing terminal.

Interactive Mode:

Characters typed into terminal are immediately transmitted to the computer.

Edit Mode:

Typed characters are placed into display memory until editing is completed, then transmitted to the computer. While in display memory, characters can be displayed and changed. Only characters sent to computer are affected. Characters received from the computer are processed as received. The screen displays both characters received from both keyboard and computer. (When characters received from the computer are displayed, the terminal keyboard may be turned on and off using keyboard action mode (KAM).)

Table 6-5 #24A/B Edit Key Execution

This feature determines how edit and interactive modes may be selected from the keyboard using SHIFT and EDIT keys.

Table 6-5 #25A/F Character Protection

This feature creates characters on the screen using protected or unprotected select graphic rendition SGR sequence. Protection attribute does not alter those of characters on the screen received. Protection does affect the way that characters are transmitted and edited.

Protected characters cannot be changed, overwritten, erased or moved by entries made on the keyboard in EDIT mode.

Any characters outside the scrolling region may be considered protected characters, since they cannot be edited, nor transmitted in a block transmission.

Table 6-5 #26A/B Erasure Mode

This feature determines whether protected characters can be erased by the computer in edit mode using the erase in the (EL) and erase in display (ED) sequences. Also, the feature may affect the deleted character (DCH), delete line (DL), and insert line (IL) sequences, and the horizontal Tab (HT) control character. For more details on its effects, refer to this chapter on these sequences and characters.

Table 6-5 #27A/B Transmit Execution

This feature determines whether transmission of edited characters to the computer is immediate by pressing ENTER (or by RETURN key in DECLTM) or deferred. In deferred transmission terminal cannot transmit until receiving a transmit sequence (DECXMIT) from computer

Table 6-5 #28: Transmission Request

(STS) when transmit execution mode (DECTEN) is set, transmission is deferred, terminal request the computer to enable transmission. Terminal will not begin transmission until the transmit sequence (DECXMIT) has been received. (STS) is transmitted when transmit execution mode (DECTEM) is reset and ENTER or RETURN key is (DECLTM) pressed.

Table 6-5 #29: Transmission Enable

This is the sequence sent by the computer to request transmission from the terminal. It may be used regardless of the transmit execution (DECTEM) setting, but is most often a response to an STS request from the terminal.

Table 6-5 #30A/B Line Transmit

This mode is used to determine whether transmission of partial page or if transmission is not by the line (this feature is reset), the transfer termination mode (TTM) is used to determine what size block of characters will be transmitted. Transmission is begun by ENTER key, and transmission may be either immediate or deferred (depending on transmit execution mode (DECTEM).)

Table 6-5 #31A/B Transfer Termination

This mode determines whether transmission (when line transmit mode (DECLTM) is reset) is performed by the full page or by the partial page. See Table 6-5 for information on determining partial page size.

Table 6-5 #32A/B Space Compression/Field Delimiter

This mode determines whether trailing spaces at the end of a field are transmitted as displayed (SP, 20HEX CODE) or not transmitted but ended by record separator character (RS, 1E HEX CODE).

- | | |
|---|--|
| <p>(1) Space Compression/ Field Delimiter Mode (DECSCFDM) Set</p> | <p>No Trailing spaces in field are transmitted. A single record separator character (RS, 1E HEX CODE) ends all fields transmitted. Last transmitted field on a line is delimited by a Carriage Return character (CR 0D HEX CODE) or by both carriage return and line feed characters (CR LF, 0D 0A HEX CODES).</p> |
| <p>(2) Space Compression/ Field Delimiter Mode (DECSCFDM) Reset</p> | <p>All characters transmitted as displayed on terminal screen. Empty spaces on screen are transmitted as space character (20 HEX CODE).</p> |

Table 6-5 #33A/B Guarded Area Transmit

This mode determines whether protected fields are transmitted to the computer or replaced by a recorder separator character (RS, HEX 1E.) in edit mode. In printing, this mode determines whether protected fields will be printed as they appear in the screen display or replaced by space characters.

- | | |
|--|---|
| <p>(1) Guarded Area Transmit Mode (GATM) Set</p> | <p>Protected fields in the transmit block are transmitted.</p> |
| <p>(2) Guarded area Transmit Mode (GATM) Reset</p> | <p>When protected fields are encountered, a single record separator character (RS, 1E HEX CODE) is transmitted instead.</p> |

Table 6-5 #34A/B Transmit Termination Character

This feature selects the control character to be transmitted at the end of a transmitted character block, signaling the end of transmission, in edit mode. In half duplex coded control (HDX B), this sequence is ignored.

Character at End of Transmission

To indicate the end of block transmission, select following choices:

Transmit termination character sequence (DECTTC)

Form feed character (FF, 0C HEX CODE)

End of text (ETC, 03 HEX CODE)

End of transmission (EOT; 04 HEX CODE); carriage return (CR; 0D)

Device control code 3 (DC; 13)

Table 6-5 #35A/G Printing

All printing operations can be selected by using these sequences, through the VA 120 terminals serial printer interface. Printing auto print and print screen may be selected from the keyboard.

In any print operation, it is necessary to check the printer status. The printer is checked by ANSI mode printer status report (DSR). No operation can begin until the printer is ready.

Characters transmitted from the screen to the printer use the space character (SP 20 HEX code) to represent spaces. Tab stops in both terminal and printer are ignored.

Double height characters are printed as two lines of identical standard width characters. Double width characters are printed as character of standard width on a single line.

Note: Printer controller operation can be selected and performed while auto print operation, because printer controller has a higher priority than auto print. Auto print can be turned on or off a any time, but can not be performed in edit mode.

Table 6-5 #36A/B Printer Extent

This feature determines whether the printing operation will be performed for the complete screen or for the scrolling region only.

Printing operations' effect on protected field is not controlled by this feature. See guarded transfer mode in this Chapter.

Table 6-5 #37A/B Print Termination Character

This feature (printer form feed mode) determines whether the form feed (FF, 0C HEX) character will be used as a print termination character at the end of print screen operation.

Table 6-5 #38A/M Reports

This feature has sequences which control a form of communication between the terminal and the computer or printer, where the computer requests information

and the terminal responds with status report on terminal and printer, report on states of terminal, and report on cursor position.

During printer controller operation, the terminal ignores those (DSR, DA or DECID) sequences.

Table 6-5 #39: Reset

This feature causes an internal power up self-test to be performed by the terminal. SET-UP selections in the user memories are then selected. Meanwhile, before a reset is performed, the terminal disconnects from its communication line. The following modes are automatically selected after reset:

Keypad numeric mode (DECKPNM)
Cursor key mode (DECCKM) reset
Origin mode (DECOM) reset
Complete screen scrolling region

2. VT 52 COMPATIBLE SEQUENCES

VT 52 compatibility can be selected from the keyboard in SET-UP or from the computer. These sequences meet private DIGITAL standards. For more details about VT 52, see the ANSI compatible sequences section of this Chapter.

Sequences are used in VT 52 to select following three modes:

- (1) ANSI mode
- (2) Alternate keypad mode on
- (3) Alternate keypad mode off

When the alternate keyboard mode is off, the numeric keypad mode is selected.

TABLE 6-9 VT52 COMPATIBLE SEQUENCES

| NAME AND MNEMONIC | S SEQUENCE | FUNCTION |
|--|---|---|
| 1. ANSI MODE | ESC < 1B 3C | Causes all sequences to be interpreted as ANSI standards X3.64-1979 and X3.41-1974 VT52 sequence, is not recognized. |
| 2A. ENTER ALTERNATE KEYPAD MODE | ESC = 1B 3D | Causes the auxiliary keypad keys to generate sequences defined by applications program. |
| 2B. EXIT ALTERNATE KEYPAD MODE (NUMERIC MODE) | ESC > 1B 3E | Causes the auxiliary keypad keys to generate characters like those of the main keyboard: numeric, comma, period and minus sign. |
| 3A. ENTER GRAPHICS MODE | ESC F 1B 46 | Used to select the special character and line drawing character set. |
| 3B. EXIT GRAPHICS MODE | ESC G 1B 47 | Used to select the character set chosen in SET-UP. |
| 4A. CURSOR UP | ESC A 1B 41 | Cursor is moved up one line in same column. Cannot be moved if at the top of the screen. |
| 4B. CURSOR DOWN | ESC B 1B 42 | Cursor is moved down one line in the same column. Cannot be moved if at the bottom of the screen. |
| 4C. CURSOR RIGHT | ESC C 1B 43 | Cursor is moved one space to the right in the same line. Cannot be moved when at the right margin. |
| 4D. CURSOR LEFT | ESC D 1B 44 | Cursor is moved one space to the left in the same line. Cannot be moved if at the left margin. |
| 4E. CURSOR TO HOME | ESC H 1B 48 | Cursor is moved to the HOME position. |
| 4F. DIRECT CURSOR ADDRESS | ESC Y LINE COLUMN 1B 59 ** ** | Cursor is moved to specified line and column, as directed by line and column numbers which are ASCII characters. |

| NAME AND MNEMONIC | SEQUENCE | FUNCTION |
|-------------------------------|----------------|---|
| 4G. REVERSE LINE FEED | ESC I 1B 49 | Cursor is moved up one line in same column. If at top margin, a downward scroll is performed. |
| 5A. ERASE TO END OF LINE | ESC K 1B 4B | Causes all characters, beginning at cursor position (including character at cursor), till end of the line to be erased. Cursor remains in same position. |
| 5B. ERASE TO END OF SCREEN | ESC J 1B 4A | Causes all characters, beginning at cursor position (including character at cursor) until end of screen to be erased. The cursor remains in same position. |
| 6A. AUTO PRINT | ESC A 1B 5E | This sequence begins the auto print operation: When the cursor is moved off a line, that line will be printed. The cursor moves off lines when directed by a line feed (LF, 0A HEX), a form feed, (FF, 0C HEX) vertical tab (VT, 0B HEX) control character, or when moved by an auto wrap operation. In an auto wrap the line is ended with CR, LF. Transmission to computer also includes the line-ending control character. |
| 6B. AUTO PRINT | ESC - 1B 5F | Causes auto print operation to be turned off. |
| 6C. PRINTER CONTROLLER | ESC W 1B 57 | This sequence turns on the printer controller operation. Characters received by the terminal are sent to the printer without alteration (no spaces inserted or deleted, no line delimiters or character set selected in the printer) and without displaying characters on the terminal screen. |
| 6D. PRINTER CONTROLLER | ESC X 1B 58 | This sequence turns off the printer controller operation. Printer head must be moved to the left margin before leaving printer controller. |

| NAME AND MNEMONIC | SEQUENCE | FUNCTION |
|-----------------------------|---------------------|--|
| 6E. PRINT CURSOR LINE | ESC] 1B 5D | This sequence causes one line at the cursor position to be printed. The cursor remains in the same position. Operation ends at end of this line. |
| 6F. PRINT SCREEN | ESC V 1B 56 | Used to print the entire screen. As selected by the print extent (DECPEX) sequence, either the full screen or only the scrolling region (as selected by the DECSTBM sequence) will be printed. Printing operation ends when screen is printed. |
| 7A. IDENTIFY | ESC Z 1B 5A | Used to send and identify sequence from terminal to computer. |
| 7B. IDENTIFY | ESC \ Z 1B 2F 5A | Terminal responds to identify. |

EXPLANATION ON TABLE 6-9 VT 52 COMPATIBLE SEQUENCES

Table 6-9 #1: ANSI/VT 52 Compatibility

This sequence determines whether the VA 120 terminal is compatible with ANSI or VT 52. Features selected while in ANSI are also used in VT 52. However most features cannot be changed from VT 52. And so if changes are desired, it is necessary to return to ANSI mode.

Table 6-9 #2A/B Keypad Character Selection

This mode determines the characters generated by the auxiliary keypad in VT 52. They may be selected as either alternate numeric keypad mode. See Table 6-10

Numeric keypad mode is selected automatically following a power up or reset, or during a communication line connection unless in full duplex no modem control (FDX A)

TABLE 6-10 VT 52 KEYPAD CODES

| WHEN NUMERIC KEYPAD MODE: | KEY | CHARACTERS GENERATED. | HEX CODE |
|------------------------------|---------------------|-----------------------|--------------------|
| | 0 | 0 | 30 |
| | 1 | 1 | 31 |
| | 2 | 2 | 32 |
| | 3 | 3 | 33 |
| | 4 | 4 | 34 |
| | 5 | 5 | 35 |
| | 6 | 6 | 36 |
| | 7 | 7 | 37 |
| | 8 | 8 | 38 |
| | 9 | 9 | 39 |
| | — (MINUS) | — | 2D |
| | , (COMMA) | , | 2C |
| | . (PERIOD) | . | 2E |
| | ENTER (SEE NOTE) | CR or CR and LF | 0D or 0D and 0A |
| | PF1 | ESC P | 1B 50 |
| | PF2 | ESC Q | 1B 51 |
| | PF3 | ESC R | 1B 52 |
| | PF4 | ESC S | 1B 53 |

NOTE: When numeric keyboard is selected, the **ENTER** key generates the same characters as the **RETURN** key. These characters are determined by selection of the line feed/new line feature. When the line feed/new line feature is off, only a carriage return (**CR**) character is generated. When on, both the **CR** and the line feed (**LF**) characters are generated.

| WHEN ALTERNATE KEYPAD MODE: | KEY | CHARACTERS GENERATED | HEX CODE |
|-----------------------------|------------|-------------------------|------------|
| | 0 | ESC ? p | 1B 4F 70 |
| | 1 | ESC ? q | 1B 4F 71 |
| | 2 | ESC ? r | 1B 4F 72 |
| | 3 | ESC ? s | 1B 4F 73 |
| | 4 | ESC ? t | 1B 4F 74 |
| | 5 | ESC ? u | 1B 4F 75 |
| | 6 | ESC ? v | 1B 4F 76 |
| | 7 | ESC ? w | 1B 4F 77 |
| | 8 | ESC ? x | 1B 4F 78 |
| | 9 | ESC ? y | 1B 4F 79 |
| | - (MINUS) | ESC ? m | 1B 4F 6D * |
| | , (COMMA) | ESC ? l | 1B 4F 6C * |
| | . (PERIOD) | ESC ? n | 1B 4F 6E |
| | ENTER | ESC ? M | 1B 4F 4D |
| | PF1 | ESC P | 1B 4F |
| | PF2 | ESC Q | 1B 4F |
| | PF3 | ESC R | 1B 4F |
| | PF4 | ESC S | 1B 4F |

* Not Generated by the VA 120.

Table 6-9 #3A/B Character Sets and Selection

This feature is used to select between the US/UK character set selected in SET-UP and the special character and line drawing character set. The UK/US set is shown in Table 6-7, and the special line and drawing character set in Table 6-8. Table 6-11 shows a comparison of two character set, the VA 120 special line

and drawing set compared to those of VT 52 terminal. Note that the characters used by the VA 120 are different from those of the VT 52.

After a communication line connection, the terminal automatically uses the character set chosen in SET-UP unless in Full Duplex no Modem Control (FDX A).

Table 6-7 US/UK Character Set

| BITS | | | | 0 | | 0 | | 0 | | 0 | | 1 | | 1 | | 1 | | 1 | | |
|------|----|----|----|-----|-----|-----|---------------|--------|-----|--------|---|--------|---|---------|---|---------|---|----------|---|----------|
| | | | | 0 | | 1 | | 0 | | 1 | | 0 | | 1 | | 0 | | 1 | | |
| B4 | B3 | B2 | B1 | ROW | 0 | | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | |
| 0 | 0 | 0 | 0 | 0 | NUL | 000 | | 201610 | SP | 403220 | 0 | 604830 | @ | 1006440 | P | 1208050 | \ | 1409660 | p | 16011270 |
| 0 | 0 | 0 | 1 | 1 | | 111 | DC1 (XON) | 211711 | ! | 413321 | 1 | 614931 | A | 1016541 | Q | 1218151 | a | 1419761 | q | 16111371 |
| 0 | 0 | 1 | 0 | 2 | | 222 | | 221812 | " | 423422 | 2 | 625032 | B | 1026642 | R | 1228252 | b | 1429862 | r | 16211472 |
| 0 | 0 | 1 | 1 | 3 | ETX | 333 | DC3 (XOFF) | 231913 | #/£ | 433523 | 3 | 635133 | C | 1036743 | S | 1238353 | c | 1439963 | s | 16311573 |
| 0 | 1 | 0 | 0 | 4 | EOT | 444 | | 242014 | \$ | 443624 | 4 | 645234 | D | 1046844 | T | 1248454 | d | 14410064 | t | 16411674 |
| 0 | 1 | 0 | 1 | 5 | ENQ | 555 | | 252115 | % | 453725 | 5 | 655335 | E | 1056945 | U | 1258555 | e | 14510165 | u | 16511775 |
| 0 | 1 | 1 | 0 | 6 | | 666 | | 262216 | & | 463826 | 6 | 665436 | F | 1067046 | V | 1268656 | f | 14610266 | v | 16611876 |
| 0 | 1 | 1 | 1 | 7 | BEL | 777 | | 272317 | , | 473927 | 7 | 675537 | G | 1077147 | W | 1278757 | g | 14710367 | w | 16711977 |
| 1 | 0 | 0 | 0 | 8 | BS | 888 | CAN | 302418 | (| 504028 | 8 | 705638 | H | 1107248 | X | 1308858 | h | 15010468 | x | 17012078 |
| 1 | 0 | 0 | 1 | 9 | HT | 999 | | 312519 |) | 514129 | 9 | 715739 | I | 1117349 | Y | 1318959 | i | 15110569 | y | 17112179 |
| 1 | 0 | 1 | 0 | 10 | LF | 10A | SUB | 32261A | * | 52422A | : | 72583A | J | 112744A | Z | 132905A | j | 1521066A | z | 1721227A |
| 1 | 0 | 1 | 1 | 11 | VT | 11B | ESC | 33271B | + | 53432B | ; | 73593B | K | 113754B | [| 133915B | k | 1531076B | { | 1731237B |
| 1 | 1 | 0 | 0 | 12 | FF | 12C | | 34281C | , | 54442C | < | 74603C | L | 114764C | \ | 134925C | l | 1541086C | l | 1741247C |
| 1 | 1 | 0 | 1 | 13 | CR | 13D | | 35291D | - | 55452D | = | 75613D | M | 115774D |] | 135935D | m | 1551096D | } | 1751257D |
| 1 | 1 | 1 | 0 | 14 | SO | 14E | | 36301E | . | 56462E | > | 76623E | N | 116784E | ^ | 136945E | n | 1561106E | ~ | 1761267E |
| 1 | 1 | 1 | 1 | 15 | SI | 15F | | 37311F | / | 57472F | ? | 77633F | O | 117794F | - | 137955F | o | 1571116F | | 1771277F |

KEY

ASCII CHARACTER

ESC

33
27
1B

OCTAL
DECIMAL
HEX

Table 6-8 Special Characters and Line Drawing Character Set

| BITS | | | | COLUMN | | 0 | | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | |
|------|----|----|-------------|--------|-----|----|----|----|---|---|---------|---|---|-----|---|---|---|---|---|---|---|
| B7 | B6 | B5 | B4 B3 B2 B1 | ROW | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F | G |
| 0 | 0 | 0 | 0 | 0 | NUL | 0 | 20 | SP | 0 | @ | P | ♦ | — | 160 | | | | | | | |
| 0 | 0 | 0 | 1 | 1 | | 1 | 21 | ! | 1 | A | Q | ‡ | — | 161 | | | | | | | |
| 0 | 0 | 1 | 0 | 2 | | 2 | 22 | " | 2 | B | R | ℥ | — | 162 | | | | | | | |
| 0 | 0 | 1 | 1 | 3 | ETX | 3 | 23 | # | 3 | C | S | ƒ | — | 163 | | | | | | | |
| 0 | 1 | 0 | 0 | 4 | EOT | 4 | 24 | \$ | 4 | D | T | Ɔ | — | 164 | | | | | | | |
| 0 | 1 | 0 | 1 | 5 | ENQ | 5 | 25 | % | 5 | E | U | ℒ | — | 165 | | | | | | | |
| 0 | 1 | 1 | 0 | 6 | | 6 | 26 | & | 6 | F | V | ∅ | — | 166 | | | | | | | |
| 0 | 1 | 1 | 1 | 7 | BEL | 7 | 27 | ' | 7 | G | W | ± | — | 167 | | | | | | | |
| 1 | 0 | 0 | 0 | 8 | BS | 8 | 28 | (| 8 | H | X | ℒ | — | 170 | | | | | | | |
| 1 | 0 | 0 | 1 | 9 | HT | 9 | 29 |) | 9 | I | Y | Ÿ | — | 171 | | | | | | | |
| 1 | 0 | 1 | 0 | 10 | LF | 10 | 30 | * | : | J | Z | J | — | 172 | | | | | | | |
| 1 | 0 | 1 | 1 | 11 | VT | 11 | 31 | + | ; | K | [| 1 | — | 173 | | | | | | | |
| 1 | 1 | 0 | 0 | 12 | FF | 12 | 32 | , | < | L | \ | Γ | — | 174 | | | | | | | |
| 1 | 1 | 0 | 1 | 13 | CR | 13 | 33 | — | = | M |] | ℒ | — | 175 | | | | | | | |
| 1 | 1 | 1 | 0 | 14 | SO | 14 | 34 | . | > | N | Λ | † | — | 176 | | | | | | | |
| 1 | 1 | 1 | 1 | 15 | SI | 15 | 35 | / | ? | O | (BLANK) | — | — | 177 | | | | | | | |

KEY

ASCII CHARACTER

ESC

33
27
1B

OCTAL
DECIMAL
HEX

Table 6-11 Special Characters and Line Drawing Set
and VT52 Graphics Mode Comparison

| HEX CODE | US OR UK SET | SPECIAL CHARACTERS AND LINE DRAWING SET | VT52 GRAPHICS MODE (NOT IN VA120) |
|-------------|-----------------|--|--------------------------------------|
| 5F | — | Blank | Blank |
| 60 | / | ◆ | Reserved |
| 61 | a | Checkerboard (error indicator) | Solid rectangle |
| 62 | b | H _t | 1/ |
| 63 | c | F _F | 3/ |
| 64 | d | C _R | 5/ |
| 65 | e | L _F | 7/ |
| 66 | f | ° | Degrees |
| 67 | g | ± | Plus or minus |
| 68 | h | N _L | Right arrow |
| 69 | i | V _T | Ellipsis (dots) |
| 6A | j | ┘ | Divide by |
| 6B | k | ┐ | Down arrow |
| 6C | l | └ | Bar at scan 0 |
| 6D | m | ┘ | Bar at scan 1 |
| 6E | n | + | Bar at scan 2 |
| 6F | o | — | Bar at scan 3 |
| 70 | p | — | Bar at scan 4 |
| 71 | q | — | Bar at scan 5 |
| 72 | r | — | Bar at scan 6 |
| 73 | s | — | Bar at scan 7 |
| 74 | t | Left "T" | Subscript 0 |
| 75 | u | Right "T" | Subscript 1 |
| 76 | v | Bottom "T" | Subscript 2 |
| 77 | w | Top "T" | Subscript 3 |
| 78 | x | Vertical bar | Subscript 4 |
| 79 | y | Less than or equal to | Subscript 5 |
| 7A | z | Greater than or equal to | Subscript 6 |
| 7B | | π | Subscript 7 |
| 7C | | ≠ | Subscript 8 |
| 7D | | £ | Subscript 9 |
| 7E | ~ | • | Paragraph |

Table 6-9 #4A/G Cursor Positioning

This feature controls the cursor, or active position

indicator, of the terminal. VT 52 mode margins are those selected in the ANSI mode, or, if none has been selected, the whole screen.

| OPERATION | MOVES CURSOR |
|--|--|
| 1. Character typed into display | 1. One column to the right, same line. |
| 2. Line feed (LF, HEX 0A) form feed (FF, HEX 0C) or vertical tab (VT, HEX 0B) | 2. One line down, same column. |
| 3. Line feed/new line | 3. One line down, to left margin. |
| 4. Carriage return (CR, HEX 0D) | 4. To the left margin. |
| 5. Backspace (BS, HEX 08) | 5. One column to the left, same line. |
| 6. Horizontal tab character (HT, HEX 09) | 6. To the next tab stop or to right margin if no tab has been set. |
| 7. Horizontal tab character, received when erasure mode (ERM) is reset and edit mode (DECEDM) is selected. | 7. To the next tab stop or the next unprotected field. |

Table 6-9 #5A/B Erasing

This feature is used to remove characters from the screen. Erased characters are lost.

spaces. Tab stops in both terminal and printer are ignored.

Double height characters are printed as two lines of identical standard width characters. Double width characters are printed as standard width characters on a single line.

Table 6-9 #6A/F Printing

All printing operations may be selected by using these sequences, through the VA120's serial printer interface. Two printing operations may be selected from the keyboard: Auto print and print screen.

Note: Printer controller operations can be selected and performed while in auto print operation, because printer controller has a higher priority than auto print. Auto print can be turned on and off at any time but cannot be performed while in edit mode.

In any print operation, it is necessary to check the printer status before selection. The printer is checked by ANSI mode printer status report (DSR). No operation is allowed before the printer is ready.

Table 6-9 :7A/B Reports

Characters transmitted from the screen to the printer use the space character (SP, 20 HEX code) to represent

When the computer requests an identification from the terminal, and the terminal responds, these sequences are used.

Chapter 7 Communication

I. CONNECTING TO THE COMPUTER

The VA 120 terminal can be connected to a computer directly or through a common carrier facility, such as a telephone line. There are three interfaces available: The modem interface RS232C, RS422, or 20 mA

current loop interface.

The interface connector is DB-25 (EIA RS-232-C type) male connector mounted on the back of the terminal base (Figure 7-1). This interface meets EIA standard RS-232-C, RS-422 and CCITT V. 24 and V. 28.

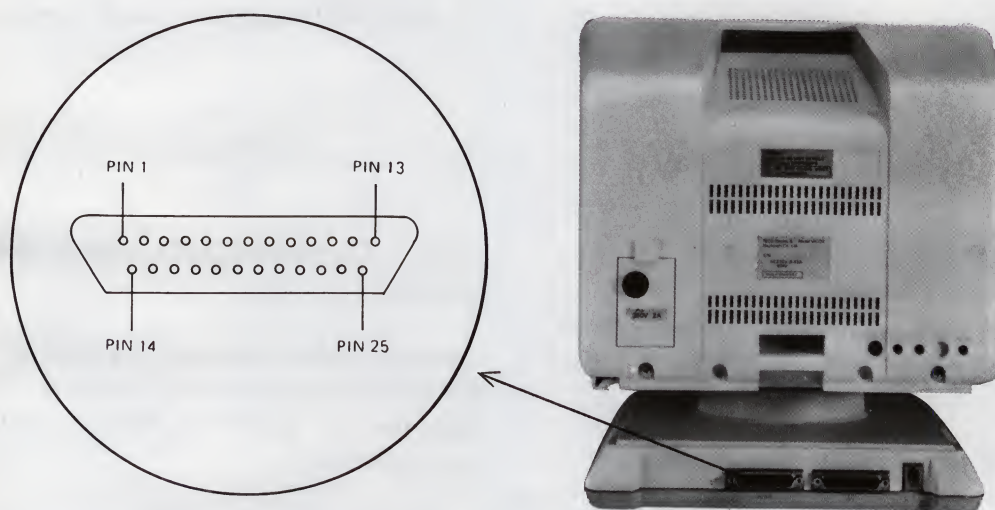


Figure 7-1 Communication (Modem) Connector Location and Pin Numbering

1. HOW TO CONNECT

There are two basic steps for connecting to the computer: modem selection, SET-UP communication feature selection.

(1) Modem Selection

The terminal's modem must be compatible with the computer's modem. Possible modem configurations are shown below in Table 7-1 (for public switched telephone lines) and Table 7-2 (dedicated telephone lines).

TABLE 7-1 POSSIBLE BELL MODEM CONFIGURATIONS (PUBLIC SWITCHED)

| MANUAL COMMUNICATION PARAMETERS | MANUAL ORIGINATE ONLY | MANUAL ANSWER ONLY | ORIGINATE/ ANSWER | AUTO ANSWER | REVERSE CHANNEL |
|---------------------------------------|-----------------------------|--------------------------|----------------------|----------------|--------------------|
| 300 baud | 113A | 113D | 103A | 103A | No |
| Full-duplex | 113C | | 103J | 103J | No |
| 2-wire | | | | 113B | No |
| | | | | 113D | No |
| | | | 212A | 212A | No |
| | | | 202S | 202S | Yes |
| 1200 baud | | | | | |
| Half-duplex | | | | | |
| 2-wire | | | | | |
| 1200 baud | | | 212A | 212A | No |
| Full-duplex | | | | | |
| 2-wire | | | | | |

TABLE 7-2 POSSIBLE BELL MODEM CONFIGURATIONS (Dedicated Line)

| COMMUNICATION PARAMETERS | MODEM | LINE CONDITIONING | REVERSE CHANNEL |
|-----------------------------|-------|--|--------------------|
| 300 baud | 103F | Unconditioned 3002 channel | No |
| Full-duplex | | | |
| 1200 baud | 202T | With reverse channel, up to 1200 baud on unconditioned or C2 conditioned 3002 channel. Without reverse channel, up to 1200 baud on unconditioned 3002 channel and 1200 to 1800 baud on C2 conditioned channel. | Yes |
| Half-duplex | | | |
| 2-wire | | | |
| 1200 baud | 202T | Without reverse channel, up to 1200 baud on unconditioned 3002 channel and 1200 to 1800 baud on C2 conditioned channel. | No |
| Full-duplex | | | |
| 4-wire | | | |

(2) SET-UP Communication Feature Selection

A detailed explanation of communication features related to SET-UP is given in the modem serial characters, break and modem control sections of this chapter, and a general explanation of SET-UP is given in Chapter 4. Note that in connecting the terminal to the computer it is necessary to match terminal SET-UP features to the type of communication used with the computer.

2. COMMUNICATION SIGNALS

The following signals are used in communication between the terminal and the computer:

2-1. Modem Serial Characters (Figure 7-2)

- The serial character format of modem interface must be the same as the character format of the computer.
- Transmission contains the following:
 - Start Bit
 - 7 or 8 data bits
 - Optional parity bit
 - 1 or 2 stop bits

—Data bits per character and parity can be selected from SET-UP.

—If selected for 8-bit characters, last bit is ignored when receiving characters. It is interpreted as SPACE (0) condition.

—Data bits are transmitted with last significant bit first (see ANSI X3.15-1976 for details on serial character format).

—Parity bit is used to check for errors in character transmission, both receiving and transmitting.

—Specific parity bit for transmitting and receiving is selected in SET-UP modem data/parity bits feature. If no selection, parity bit is removed from serial character.

—Received characters can be checked for odd and even parity only. Received characters can not be checked for mark and space parity.

—Received character parity can be checked only if selected in receive parity SET-UP feature. Otherwise parity of received characters is ignored.

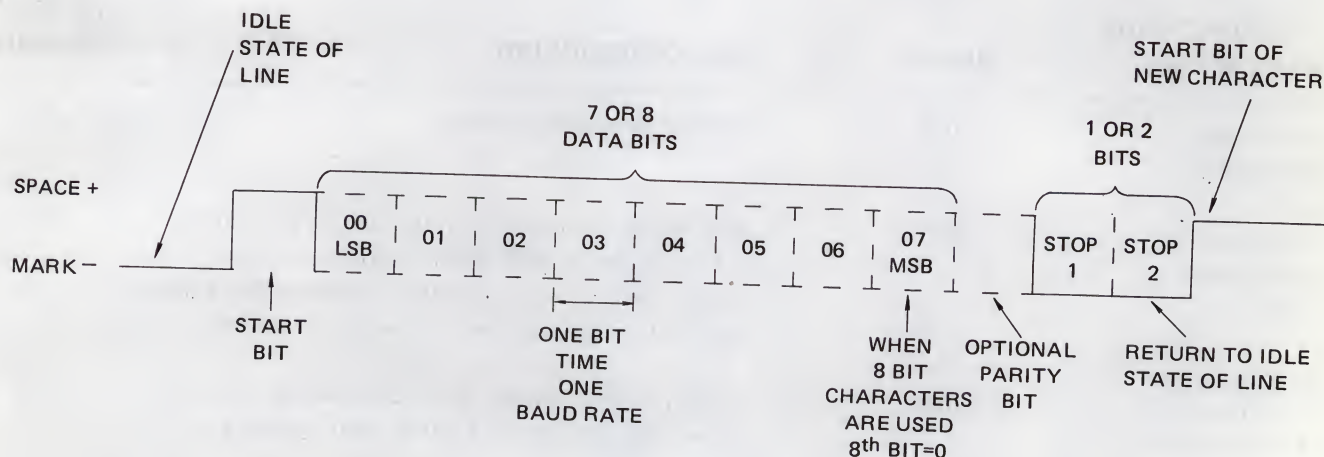


Figure 7-2 Serial Character Format

2-2. Break Signal

- Use SET-UP BREAK ENABLE feature to enable or disable the break signal.
- The break signal is a space condition transmitted for 0.275 seconds plus minus 10 percent.
- Computer and software determine computer response reacted by break signal.
- In HDX A, when terminal is receiving, the **BREAK** key turns off secondary RTS line for 0.275 seconds plus minus 10 percent.

2-3. Long Break Disconnect

- The long break disconnect is a space condition transmitted for 3.5 seconds plus minus 10 percent.
- It is normally used at the end of communication to disconnect from communication line.

—The data terminal ready interface signal is turned off by a long break disconnect.

—Long break disconnect can always be performed when terminal is on-line.

—SET-UP turnaround/disconnect feature to select a disconnect character. SET-UP disconnect character enable feature is used to determine whether this disconnect character will be transmitted before a long break disconnect is performed.

3. MODEM CONTROLS

Modem control selections are made using the SET-UP modem control feature (see Table 7-3). Modem control features must be compatible with the computer and modem. In North America, bell-system modems are used and in Europe, CCITT system is used. (See Table 7-4).

TABLE 7-3 MODEM CONTROL FEATURES

| SELECTION | DESCRIPTION | APPLICATION |
|-----------|---|--|
| FDX A | Full-duplex with no EIA modem control (data leads only) | Full-duplex communication with a null modem (direct) connection to the computer or with a modem that does not use modem control signals. |
| FDX B | Full-duplex with EIA modem control | Full-duplex communication with a modem that uses modem control signals. |
| FDX C | Asymmetric full-duplex with EIA modem control | Full-duplex communication with a half-duplex modem using the secondary channel. |
| HDX A | Half-duplex supervisory mode | Half-duplex communication with the secondary channel control lines indicating when to perform line turnarounds. |
| HDX B | Half-duplex coded control | Half-duplex communication with control characters indicating when to perform line turnarounds. |

The modem control SET-UP feature selects the type of communication that the terminal uses. This feature must be compatible to the computer and modem.

Table 7-4 lists the modem control feature selections and possible modems.

TABLE 7-4 BELL & CCITT MODEM CONTROL FEATURE AND CONFIGURATIONS

| FDX A | FDX B | | FDX C | HEX A | HDX B |
|--|--|---|--|--------------------------------------|--------------------------------------|
| DF01-A Acoustic- coupler 300 baud | Bell 103 300 baud 2-wire | D200/D300S V.21 200/300 baud 2-wire | D1200S with reverse channel V.23 rec 1200 baud Trans 75 baud 2-wire | Bell 202 1200 baud 2-wire | Bell 202 1200 baud 2-wire |
| Bell 103 300 baud 2-wire | Bell 113 300 baud 2-wire | D1200SDX V22 1200 baud 2-wire | Datel 600 modem 4 V23 | D1200S V23 1200 baud 2-wire | D1200S V23 1200 baud 2-wire |
| DF02 300 baud 2-wire | DF02 300 baud 2-wire | DFG300 V20 bis, V24 baud | Rec 600/1200 baud | | |
| Bell 113 300 baud 2-wire | Bell 212A 1200 baud 2-wire dual-speed option | 300 baud 2-wire 2 stop bits | Trans 75 baud 2-wire | | |
| Bell 212A 1200 baud 2-wire | DF03 300/1200 baud 2-wire | Dag1200M V23 1200 baud 4-wire | | | |
| DF03 300/1200 baud 2-wire | Datel 200 V.21 200/300 baud 2-wire | Datel 600 Modem 5 V.23 1200 baud 4-wire | | | |

4. GENERAL DESCRIPTION ON HALF AND FULL DUPLEX COMMUNICATION

The VA 120 can use either half or full duplex communication:

4.1. Full Duplex

Two-way simultaneous communication — characters can be transmitted and received at the same time.

Three Selections:

(1) FDX A — FULL DUPLEX WITH NO EIA MODEM CONTROL

Allows the terminal to transmit and receive using no modem control signals (data leads only) when FDX A is selected, terminal assumes connection to computer is made and communication is allowed. FDX A can be used with 20 mA current loop (Table 7-6).

FDX A is used in full duplex communication with a null modem, or direct, connection to the computer; or a modem that uses no modem control signals.

Table 7-5 lists all signals used by the VA 120 terminal in FDX A.

Table 7-6 lists pin assignment used by 20mA current loop. Signals not found on this Table are not used by this terminal.

(2) FDX B — FULL DUPLEX WITH EIA MODEM CONTROL

Allows the terminal to transmit to and receive from the computer while using modem control signals, which ensure that connection between computer and terminal has been made. Signal check is made before and during communication. When Modem control error is found, communication may not proceed.

Table 7-5 lists all signals used by the VA 120 terminal in FDX B. Signals not found on this Table are not used by this terminal.

(3) FDX C — ASYMMETRIC FULL DUPLEX WITH EIA MODEM CONTROL

This full duplex communication uses a half duplex modem must support secondary channel to use FDX C. Instead of the clear to send and request to send signals, secondary channel (at 75 baud) and receives characters on the primary channel (at 600 or 1200 baud). The modem must support secondary channel to use FDX C. Instead of the clear to send and request to send signals, secondary clear to send and secondary request to send signals are used.

Table 7-5 lists all signals used by the VA 120 terminal in FDX C. All signals not found on this Table are not used by this terminal.

FDX C uses modem control signals to ensure that the terminal and computer have a connection before communication.

4-2. Half Duplex

Two-way alternate communication — characters may be transmitted and received one direction at a time.

In half duplex, the device (terminal or computer) which is currently transmitting generates a line (carrier) signal, using request to send (RTS). When RTS is on, the device may transmit. When the transmitting device is to receive, a turnaround must be performed. RTS is then switched from one device to the other.

The initial transmitter should be determined when the terminal is connected to the computer. The SET-UP initial direction feature determines which device is the transmitter.

Characters typed on the screen in half duplex are immediately displayed on the screen unless local echo feature is selected.

There are two selections:

(1) HDX A — HALF DUPLEX SUPERVISORY MODE

Allows the computer to control line turnaround using secondary channel control signals. (Secondary request to send and secondary receive line signal detector.) Although this requires a secondary channel, the secondary channel is not used to transmit data when in HDX A.

Table 7-5 lists all signals used by the VA 120 terminal in HDX A. Signals not found on this Table are not used by this terminal.

(2) HDX B — HALF DUPLEX CODE CONTROL

Coded control indicates that a line turnaround is directed by the use of turnaround characters. These characters are selected by the turnaround/disconnect character feature in SET-UP. On receiving a turnaround character, the transmitting device (terminal or computer) uses modem control lines to turn the line around.

The turnaround characters used by this terminal are:

ETX
EOT
DC3 *
FF *
CR *

* Indicates that these characters may be selected for turnaround use, however, they are in violation of ANSI X3.3.

In HDX B, the line may be turnaround automatically in several cases:

- (A) An answerback message is transmitted.
- (B) A cursor position report is transmitted.
- (C) A device status report is transmitted.
- (D) A device attribute is transmitted.
- (E) The **RETURN** key is pressed. If the turnaround character has been selected as CR, it is not repeated.

Table 7-5 lists all signals used by the VA 120 terminal in HDX B. Signals not found on this Table are not used by this terminal.

TABLE 7-5 MODEM SIGNALS USED IN FDX A/B/C, HDX A/B.

| PIN NUMBER NAME (MNEMONIC) | CCITT EIA | USED IN | DESCRIPTION |
|----------------------------------|--------------|----------------------------------|---|
| 1 PROTECTIVE GROUND (PGND) | 101/AA | ALL | Connected to both the terminal chassis and the external ground (through the power cord's third wire). |
| 2 TRANSMIT DATA (TXD) | 103/BA | FDX A FDX B HDX A HDX B | From the terminal. This pin transmits serial characters and break signals from the terminal. TXD is in mark state, when the terminal is not transmitting characters. |
| 3 RECEIVE DATA (RXD) | 104/BB | ALL | To the terminal This pin receives serial characters transmitted by the computer. |

| PIN NUMBER NAME (MNEMONIC) | CCITT EIA | USED IN | DESCRIPTION |
|----------------------------------|--------------|---|--|
| 4 REQUEST TO SEND (RTS) | 105/CA | FDX A FDX B HDX A HDX B | From the terminal. In FDX A and FDX B: (1) This signal is on when the terminal is on-line. (2) This signal is off when the terminal is off-line. From the terminal. In HDX A and HDX B: (1) This signal is on when the terminal is ready to transmit characters. (2) This signal is off when the terminal is receiving characters. |
| 5 CLEAR TO SEND (CTS) | 106/CB | FDX A FDX B HDX A HDX B | To the terminal. In FDX A: (1) CTS keyboard indicator lights when CTS is on. (2) CTS keyboard indicator is off when CTS is off. The only function of CTS in FDX A is turning the CTS indicator on and off. To the terminal. (1) CTS is on when the modem is ready to transmit data (from terminal to computer in half duplex) and CTS indicator light is on. (2) This conductor is off when the modem is not ready to transmit data. The CTS keyboard indicator is off. |
| 6 DATA SET READY (DSR) | 107/CC | FDX A FDX B FDX C HDX A HDX B | To the terminal. In FDX A: (1) When on, turns on the DSR keyboard indicator. (2) When off, turns off the DSR keyboard indicator. The only function of DSR in FDX A is turning the DSR indicator on and off. To the terminal. When this signal is on, the DSR keyboard indicator is on; the modem is connected to a communication line; and the modem is ready to use the modem control signals. When this signal is off, the DSR keyboard indicator is off and a disconnect is performed by the terminal. |

| PIN NUMBER NAME (MNEMONIC) | CCITT EIA | USED IN | DESCRIPTION |
|---|--------------|----------------------------------|---|
| 7 SIGNAL GROUND (SGND) | 102/AB | ALL | For all cases except protective ground, this conductor acts as a common ground reference. It is connected to the protective ground conductor. |
| 8 RECEIVE LINE SIGNAL DETECTOR (RLSD) | 109/CF | FDX B FDX C HDX A HDX B | <p>To the terminal.</p> <p>When this signal is on, signals used by the communication line are good enough to transfer data.</p> <p>When this signal is off, it indicates:</p> <ul style="list-style-type: none"> – In HDX A and HDX B <p>That the VA 120 is transmitting to the computer or that the modem is not connected to the communication line.</p> <ul style="list-style-type: none"> – In FDX B and FDX C <p>That communication line signals are not good enough to transfer data. When this signal is off (in all cases) received data is not processed. (This signal is sometimes referred to CARRIER DETECT.)</p> |
| 12 SPEED INDICATOR (SI) | 112/CI | HDX B | <p>To the terminal.</p> <ol style="list-style-type: none"> (1) When this signal is on, the transmit and receive speeds of the VA 120 are 1200 baud no matter what is selected by modem transmit or SET-UP features. (2) When this signal is off, transmit and receive speeds of the terminal are determined by SET-UP transmit and receive speed feature selections. |
| 12 SECONDARY RECEIVE LINE SIGNAL DETECTOR (SRLSD) | 112/SCF | HDX A | <p>To the terminal.</p> <p>When the VA 120 is transmitting to the computer, this signal is on. When the terminal is receiving data, this signal is off. Also, when the modem is disconnected from the communication line this signal is off. (This signal is sometimes referred to as SECONDARY CARRIER DETECT.)</p> |
| 13 SECONDARY CLEAR TO SEND (SCTS) | 121/SCB | FDX C | <p>To the terminal.</p> <ol style="list-style-type: none"> (1) When this signal is on, the modem is ready to transmit data. The CTS keyboard indicator is on. (2) When this signal is off, the modem is not ready to transmit and the CTS keyboard indicator is off. |

| PIN NUMBER NAME (MNEMONIC) | CCITT EIA | USED IN | DESCRIPTION |
|--|--------------|------------|--|
| 14 SECONDARY TRANSMIT DATA (STXD) | 181/SBA | FDX C | Serial characters and BREAK signals are transmitted by this conductor from the terminal. When no characters are being transmitted, this conductor is in the MARK state. |
| 19 SECONDARY REQUEST TO SEND (SRTS) | 120/SCA | FDX C | From the terminal. In FDX C: (1) This signal is on when the terminal is ON-LINE. (2) This signal is off when the terminal is OFF-LINE. |
| | | HDX A | From the terminal. In HDX A: (1) This signal is on when the terminal is ready to send characters. (2) This signal is off when the terminal is transmitting. |
| 20 DATA TERMINAL READY (DTR) | 108.2/ CD | ALL | From the terminal. In all cases: (1) This signal is on when the terminal is ON-LINE. When on, the modem may usually answer calls (modem auto answer option). (2) This signal is off when the terminal is OFF-LINE. When off, the modem is usually disconnected and cannot respond to calls. |
| 23 SPEED SELECT (SPSD) | 111/CH | FDX B | From the terminal. (1) This signal is on when the SET-UP receive speed feature has been selected for a speed over 600 baud. (2) This signal is off when the SET-UP receive speed feature has been selected for a speed under 600 baud. |

TABLE 7-6 PIN ASSIGNMENT FOR 20MA CURRENT LOOP

| PIN NUMBER | FUNCTION |
|------------|---------------|
| PIN 17 | TRANSMIT DATA |
| PIN 24 | TRANSMIT DATA |
| PIN 18 | RECEIVE DATA |
| PIN 25 | RECEIVE DATA |

PIN 17 and P24 are Interchangeable.

PIN 18 and P25 are Interchangeable.

5. FULL DUPLEX COMMUNICATION

In full duplex communication (FDX A, FDX B, and FDX C) characters can be transmitted and received at the same time. Modem control signals are used by FDX B and FDX C to ensure that a connection has been made between terminal and computer before communication begins.

5.1 FDX A: Full Duplex without Modem Controls

In FDX A, the terminal assumes it is connected to the computer, regardless of any modem control signals, whenever the data terminal ready (DTR) signal is on. The condition of other modem control lines does not affect communication.

The DTR signal is on unless:

The terminal is off line

The terminal is performing a long break disconnect.

5.1.1. FDX A Connection

When the DTR signal turns on, the terminal prepares to communicate with the computer. At this time:

- (1) The terminal keyboard buffer is erased. The KBD locked indicator is turned off.
- (2) Printing operations are stopped. Requests for print operations are ignored by the terminal.
- (3) The character set (US/UK) selected by the **SET-UP** character set feature is used. Character sets selected by the computer are not used.
- (4) If the **SET-UP** XON/XOFF feature is selected, communication may occur in both directions. XON is assumed.

5.1.2. FDX A Disconnection

The VA 120 terminal can disconnect (hang up) the

communication line (telephone) by turning off the data terminal ready (DTR) signal. This occurs:

- (1) If the terminal switches off line.
- (2) If a recall reset, or general default is performed by the terminal.
- (3) If a long break disconnect is performed by the terminal. When the **SET-UP** disconnect character enable feature is on, the terminal transmits a disconnect character.
- (4) If the terminal receives a disconnect character when the **SET-UP** disconnect character enable feature is on.

5.2 FDX B: Full Duplex with Modem Controls

In FDX B, communication occurs only when the terminal receives the correct modem control signals. These signals are used to ensure a connection exists between the terminal and the computer for communication. If there is no connection, communication cannot take place.

5.2.1 FDX B Connection

The terminal waits for the following signals before beginning communication in FDX B:

Clear to send — turns on

Receive line

Signal detector — turns on

Data set ready — turns on

If any one of these signals is off, no communication can occur in FDX B.

When the DSR signal turns on, the terminal prepares to communicate with the computer. At this time:

- (1) The terminal keyboard buffer is erased. KBD locked indicator is turned off.

- (2) Printing operations are stopped. Requests for print operations are ignored by the terminal.
- (3) The character set (US/UK) selected by the **SET-UP** character set feature is used. Character sets selected by the computer are not used.
- (4) Numeric keypad mode is used. The keypad's numeric keys generate numeric characters. Cursor keys transmit cursor movement commands.
- (5) Insert mode is turned off, and replace mode is selected. The insert indicator is turned off, and received characters replace the characters at the cursor position.
- (6) If the **SET-UP** XON/XOFF feature is selected, communication may occur in both directions. XON is assumed.

5.2.2 FDX B Disconnection

The **VA 120** terminal can disconnect (hang up) the communication line (telephone) by turning off the data terminal ready (DTR) signal. This occurs:

- (1) If the terminal switches off line.
- (2) If a recall, reset, or general default is performed by the terminal.
- (3) If a disconnect character is received when the **SET-UP** disconnect character enable feature is on.
- (4) If a shift break disconnect is performed. The terminal will transmit a disconnect character if the **SET-UP** disconnect character enable feature is on.
- (5) If the data set ready (DSR) signal is turned off at any time during communication.
- (6) If the RLSD signal is lost for a longer time than a limit time set by the **SET-UP** disconnect delay feature. This may occur after a connection has been made.

- (7) If the terminal fails to turn on RLSD within 30 seconds after DSR has been turned on.

5.3 FDX C: Asymmetric Full Duplex

FDX C is a full duplex communication which used a half duplex modem with a secondary channel. Characters are received by the terminal at 600 or 1200 Baud. Characters are transmitted by the terminal on a secondary channel at 75 Baud.

5.3.1. FDX C Connection

In FDX C, communication occurs only when the terminal receives the correct modem signals. The terminal waits for the following signals before beginning communication in FDX C:

Secondary clear to send — turn on

Receive line signal
Detector — turn on

Data set ready — turn on

If any one of these signals is off, no communication can occur in FDX C.

When the data set ready (DSR) signal is turned on, the terminal prepares to communicate with the computer. At this time:

- (1) The terminal keyboard buffer is erased. KBD LOCKED indicator is turned off.
- (2) Printing operations are stopped. Requests for print operations are ignored by the terminal.
- (3) The character set (US/UK) selected by the **SET-UP** character set feature is used. Character sets selected by the computer are not used.
- (4) Numeric keypad mode is used. The keypad's numeric keys generate numeric characters. Cursor keys transmit cursor movement commands

- (5) Insert mode is turned off, and replace mode is selected. The insert indicator is turned off, and received characters replace the characters at the cursor position.
- (6) If the **SET-UP XON/XOFF** feature is selected, communication may occur in both directions. XON is assumed.

5.3.2 FDX C Disconnection

The terminal can disconnect (hang up) the communication line (telephone) by turning off the data terminal ready (DTR) signal. This occurs:

- (1) If the terminal switches off-line
- (2) If a recall, reset, or general default is performed by the terminal.
- (3) If a disconnect character is received by the terminal when the SET-UP disconnect character enable feature is on.
- (4) If a shift break disconnect is performed. The terminal will transmit a disconnect character if the SET-UP disconnect character enable feature is on.
- (5) If the data set ready (DSR) signal is lost at any time during communication.
- (6) If the RLSD signal is lost for a longer time than a limit time set by the SET-UP disconnect delay feature. This may occur after a connection has been made.
- (7) If the terminal fails to turn on RLSD within 30 seconds after DSR is turned on.

6. HALF DUPLEX COMMUNICATION

In half duplex communication (HDX A and HDX B) characters are transmitted or received one direction at a time. The terminal may either receive characters or transmit characters, depending on the direction of

the communication line. When a change in direction is desired, a line turnaround is performed.

6.1. HDX A: Half Duplex with Supervisory Control

In HDX A the computer can control line turnarounds, using secondary channel control signals. Secondary channels are not used to transfer data in HDX A.

6.1.1 HDX A Connection

When the DTR signal turns on, the terminal prepares to communicate with the computer. At this time:

- (1) The terminal keyboard buffer is erased. The KBD LOCKED indicator is turned off.
- (2) Printing operations are stopped. Requests for print operations are ignored by the terminal.
- (3) The character set (US/UK) selected by the SET-UP character set feature is used. Character sets selected by the computer are not used.
- (4) Numeric keypad mode is used. The keypad's numeric keys generate numeric characters. The cursor keys transmit cursor movement commands.
- (5) Insert mode is turned off, and replace mode is selected. The insert indicator is turned off, and received characters replace the characters at the cursor position.
- (6) The initial direction selected in the SET-UP initial direction feature is used to determine the direction of the communication line.

6.1.2 HDX A Disconnection

The VA 120 terminal can disconnect (hang up) the communication line (telephone) by turning off the data terminal ready (DTR) signal. This occurs:

- (1) If the terminal switches off-line.

- (2) If a recall, reset, or general default is performed by the terminal.
- (3) If a disconnect character is received by the terminal when the SET-UP disconnect character enable feature is on.
- (4) If a shift break disconnect is performed. The terminal will transmit a disconnect character if the SET-UP disconnect character enable is on.
- (5) If the data set ready (DSR) signal is lost at any time during communication.
- (6) If a line turnaround is not completed within 5 seconds.
- (5) The RETURN key is pressed (only one CR character is transmitted in this case if CR is selected as the turnaround character).
- (6) A block of characters is transmitted by the terminal in edit mode.
- (7) The ENTER key is pressed in edit mode, or the RETURN key is pressed in line transmit mode with transmit termination mode deferred. After the sequence is transmitted, the line is turned around.
- (8) The SHIFT and EDIT keys are pressed in sequence with EDIT key execution mode deferred. After the sequence has been transmitted by the terminal the line is turned around.

6.2 HDX B: Half Duplex with Coded Control

In HDX B, the communication line direction is controlled by the transmitting device. The transmitter can generate control characters to perform line turnarounds. These control characters are selected by the SET-UP turnaround/disconnect character feature. Line turnarounds are performed using modem control lines.

Turnaround characters used by the VA 120 terminal are: ETX, EOT, and possibly DC3, FF, and CR. The last three characters may be used but violate ANSI X3.4.

If the SET-UP line turnaround feature has been selected for auto, line turnarounds automatically occur when:

- (1) An answerback message is transmitted by the terminal.
- (2) A cursor position report is transmitted by the terminal.
- (3) A device status report is transmitted by the terminal.
- (4) A device attribute is transmitted by the terminal.

When the SET-UP line turnaround feature is selected for manual, the turnaround character must be selected from the keyboard.

In edit mode, automatic turnaround is always used.

6.2.1 HDX B Connection

When the data set ready (DSR) signal turns on, the terminal prepares to communicate with the computer. At this time:

- (1) The terminal keyboard buffer is erased. The KBD LOCKED indicator is turned off.
- (2) Printing operations are stopped. Requests for print operations are ignored by the terminal.
- (3) The character set (US/UK) selected by the SET-UP character set feature is used. Character sets selected by the computer are not used.
- (4) Numeric keypad mode is used. The keypad's numeric keys generate numeric characters. Cursor keys transmit cursor movement commands.
- (5) Insert mode is turned off, and replace mode is selected. The insert indicator is off, and

received characters replace the characters at the cursor position.

- (6) The initial direction selected in the SET-UP initial direction feature is used to determine the direction of the communication line.

6.2.3 HDX B Disconnection

The VA 120 terminal can disconnect (hang up) the communication line (telephone) by turning off the data terminal ready (DTR) signal. This occurs:

- (1) If the terminal switches off-line.
- (2) If a recall, reset, or general default is preformed by the terminal.
- (3) If a disconnect character is received by the terminal when the SET-UP disconnect character is performed.

- (4) If a shift break disconnect is performed the terminal transmits a disconnect character when disconnect character enable SET-UP feature is on.
- (5) If the data set ready (DSR) signal is lost at any time during communication.
- (6) If RLSD is lost for more than 5 seconds without receiving a turnaround character.
- (7) If a line turnaround is not completed within 5 seconds.

6.3 Transmitting and Receiving Characters in Half Duplex HDX A

In HDX A, after connection between the terminal and the computer has been made, line turnaround is controlled by modem control signals on the second channel. The signals sent and received by the terminal and computer are listed below.

6.3.1 Terminal to Receive Data in HDX A

| | |
|----------|---|
| COMPUTER | Turns off secondary request to send. This turns off secondary receive line signal detector signal to the terminal. |
| TERMINAL | Responds by turning off request to send signal (clear to send signals turned off). This turns off the receive line signal detector to the computer to be turned off. |
| COMPUTER | Responds by turning on the request to send signal. This turns on the receive line signal detector to the terminal. |
| TERMINAL | Responds by turning on the secondary request to send signal this turn on the secondary receive line signal to the computer. The terminal is then ready to receive characters transmitted from the computer. |

6.3.2 Terminal to Transmit Data in HDX A

| | |
|----------|---|
| COMPUTER | Turns off the request to send signal and turns on the secondary request to send signal. This turns off the receive line signal detector and turn on the secondary receive line signal detector at the terminal. |
| TERMINAL | Responds by turning off the secondary request to send signal and turning on the request to send signal. This turns off the secondary receive line signal on the computer and |

turns on the receive line signal detector to the computer. The terminal then waits for the CTS signal to turn on allowing the terminal to transmit characters to the computer.

6.3.3 Terminal to Receive Data in HDX B

COMPUTER Turns on request to send signal. This turns on the receive line signal to the terminal.

TERMINAL The terminal's request to send signal is off, so that the clear to send signal to the terminal is off. The terminal is ready to receive characters from the computer.

6.3.4 Terminal to Transmit Data in HDX B

TERMINAL Receives a turnaround character and turns on request (RTS).

COMPUTER Receive line signal detector (RLSD) is turned on at the computer.

TERMINAL Turns on clear to send (CTS) at the terminal. Terminal is then ready to transmit characters.

6.4 Half Duplex Control Signal Summary

Half duplex control signals are summarized in Table 7-7.

Table 7-7 HALF Duplex-Modem Control Signal Summary

| Signal | Used in | Source | Receive | Transmit |
|-----------------------------------|---------|-------------|---------|----------|
| Data terminal ready | HDX A/B | From VA120 | On | On |
| Data set ready | HDX A/B | To VA 120 | On | On |
| Request to send | HDX A/B | From VA 120 | Off | On |
| Clear to send | HDX A/B | To VA 120 | Off | On |
| Receive line signal detector | HDX A/B | To VA 120 | On | Off |
| Secondary request to send | HDX A | From VA 120 | On | Off |
| Secondary receive signal detector | HDX A | To VA 120 | Off | On |

7. CHARACTERS OVERFLOW IN COMMUNICATION

7.1 It is Possible for Characters to be lost during Communication in the Following Instances:

(1) Input buffer overflow.

Except NUL and DEL characters, a character received by the terminal is stored in the terminal's input buffer at any time, and is removed from the input buffer when the character is processed by the terminal. If characters are placed in the buffer faster than they can be processed by the terminal, the buffer begins to fill. When the number of characters in the buffer exceeds its capacity, additional overflow characters received will be lost. See below for ways to prevent from input buffer overflow loss.

(2) Resets

The control sequences reset (RIS) initialize the terminal, at the same time causing the input buffer erased, so that characters received while this functions processed are lost.

(3) Keyboard transmit buffer overflow.

The keyboard transmit buffer of the VA 120 terminal is capable of holding between three and seven keystrokes. This buffer holds being transmitted from the terminal to the computer. When the number of characters in the buffer exceeds capacity, characters may be lost.

7.2 Methods to Prevent Input Buffer Overflow

The VA 120 terminal has methods for avoiding loss of characters in each of the above-mentioned cases. These are:

7.2.1 XON/XOFF Control Characters

XON/XOFF control characters method is recommended for use in full duplex communication to avoid input buffer overflow. This is the only method used to control transmission of characters from the terminal to the computer through the keyboard transmit buffer in full duplex, and is also used to control characters received into the input buffer. The XON/XOFF feature can also be used to prevent character loss in the reset sequences feature.

XON/XOFF is used in transmission between computer and terminal (through input buffer) to stop and start transmission. When the auto SET-UP XON/XOFF feature is on, the XON and XOFF control characters are used to indicate the number of characters in the input buffer. If the input buffer has only limited characters' space, terminal transmits an XOFF and stops transmission from computer. If the computer fails to respond to XOFF, the input buffer continues to fill. If the input buffer is almost full, the terminal transmits a second XOFF character. The second XOFF is the last request of the terminal to stop transmission.

When the computer stops transmission, the terminal continues to process those characters in the input buffer until the number of characters in the input buffer is reduced to nearly empty, the terminal transmits an XON (DC1, 11 HEX code) character requesting the computer to resume transmission.

The computer must respond to the first XOFF character (request to stop transmission) within a certain period of time. Otherwise the buffer will overflow.

XON/XOFF is also used to prevent the loss of characters in transmission from the terminal to the computer (through the keyboard transmit buffer). The XON and XOFF characters are used by the computer when auto XON/XOFF is on, in full duplex. When the terminal receives an XOFF character from the computer, it stops the transmission of any characters except XON and XOFF. Characters that exceed the 3 to 7 strokes limit of the keyboard transmit buffer cause a keyboard lock to be performed: The KBD

locked indicator is on and, if the SET-UP keyboard click feature is on, keyclicks stop.

When the computer transmits an XON character, the terminal resumes transmission. When the keyboard buffer is empty, the KBD locked indicator is turned off and keyclicks will sound when keys are pressed (if the SET-UP keyclick feature is on.)

The keyboard is also unlocked by entering and exiting SET-UP. In this case, the KBD locked indicator will be turned off and the terminal will be permitted to transmit characters. Note that characters transmitted in this way may be lost if the computer is unable to receive characters.

7.2.2 Fill Characters

Fill characters which can be used as fill character by the computer can be used to prevent input buffer overflows. The NULL character (00, HEX) is not placed in the input buffer when received by the terminal and is not processed by the terminal. So, the terminal is free to process previously received characters while fill characters are being transmitted by the computer.

Fill characters are transmitted after each control function or displayable character, so the terminal can process either of them before receiving more characters. The number of fill characters transmitted after a control function or character is determined by both the control function transmitted and the receive speed of the terminal. See Table 7-8 for specific information in each case.

TABLE 7-8 FILL CHARACTERS

| BAUD RATE | PARAMETER | | | | | | | | | |
|--------------|---|---------|--------|--------------------|-------------------|---|--------------------|-------------------|---------|---|
| | IND, LF, NEL, RI (SMOOTH SCROLL) | DECCOLM | DECALN | ED (132 COL) | ED (80 COL) | IND, LF, NEL, RI (JUMP SCROLL) | EL (132 COL) | EL (80 COL) | DECINLM | ALL OTHERS EXCEPT RIS AND DECTST |
| 19200 | 324 | 191 | 190 | 144 | 104 | 32 | 6 | 4 | 7 | 2 |
| 9600 | 162 | 96 | 95 | 72 | 52 | 16 | 3 | 2 | 3 | 1 |
| 4800 | 81 | 48 | 48 | 36 | 26 | 8 | 1 | 1 | 2 | 0 |
| 2400 | 41 | 24 | 24 | 18 | 13 | 4 | 1 | 1 | 1 | 0 |
| 2000 | 34 | 20 | 20 | 15 | 11 | 3 | 1 | 0 | 1 | 0 |
| 1800 | 30 | 18 | 18 | 14 | 10 | 3 | 1 | 0 | 1 | 0 |
| 1200 | 20 | 12 | 12 | 9 | 7 | 2 | 0 | 0 | 0 | 0 |
| 600 | 10 | 6 | 6 | 5 | 3 | 1 | 0 | 0 | 0 | 0 |
| 300 | 5 | 3 | 3 | 2 | 2 | 0 | 0 | 0 | 0 | 0 |
| 150 | 3 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 134.5 | 2 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 110 | 2 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 75 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |

7.2.3 Low Speed Operation

Input buffer overflow can be avoided by adjusting the speed at which the terminal receives characters to be slower than the speed at which it processes characters. In this way the input buffer is emptied at a faster rate than it is filled. The computer may never send ESC codes to the terminal, the receive speed of the terminal must be 4800 baud rate or less, and the smooth scroll feature must be off if the terminal is to use a low receive speed (Baud rate).

II. CONNECTING TO THE PRINTER

The VA 120 terminal connects to a serial printer using a printer interface.

1. PRINTER INTERFACE

The printer interface uses full duplex with no modem control (data leads only). XON/XOFF is used to prevent loss of characters from printer input buffer overflow.

The terminal should also be communicating to the computer in full duplex communication and make use of XON/XOFF to prevent loss of characters from the terminal's input buffer. Correct operation of the printer cannot be guaranteed when full duplex and XON/XOFF are not used. (The best way to ensure proper operations when full duplex or XON/XOFF are unavailable is by using the fastest transmit and receive speed (Baud rate) possible in the PRINTER and using a large input buffer in the printer.)

When the printer is not ready to print, it should turn off the DTR signal for most efficient results. Since the DTR signal has a higher priority than the XON/XOFF characters, it will supercede an XON in preventing the printer from operating. When DTR is on, the terminal assumes an XON.

The printer interface is a DB-25 (EIA RS-232-C type) male connector, mounted on the back of the terminal base. (Figure 7-3)

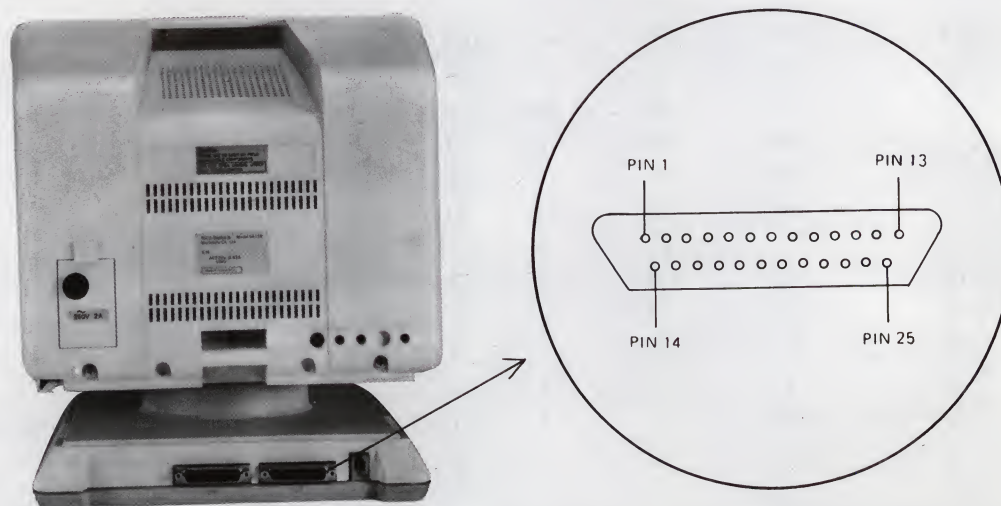


Figure 7-3 Aux. Port (Printer) Interface Connector

The interface meets standards set by Electronic Industry Association RS-232-C and International Telegraph and Telephone Consultive Committee (CCITT) recommendation V.28.

Pin assignments for the printer interface are listed in Table 7-9. Signals not listed are not used by this terminal.

TABLE 7-9 PRINTER INTERFACE ASSIGNMENTS

| PIN | NAME (MNEMONIC) | CCITT/ EIA | FUNCTION |
|-----|------------------------------|---------------|--|
| 1 | PROTECTIVE GROUND (PGND) | 101/AA | Connects to terminal chassis and external ground lead of AC CORD |
| 2 | TRANSMIT DATA (TXD) | 103/BA | FROM VA 120 Terminal transmits serial characters on TXD to printer when characters are not transmitted TXD is in Mark state |
| 3 | RECEIVE DATA (RXD) | 104/BB | TO VA 120 Terminal receives only XON and XOFF, all other characters ignored. |
| 6 | DATA SET READY (DSR) | 107/CC | TO VA 120 Terminal receives DTR from printer on DSR. If DTR from printer has not been ON since power up or reset, terminal ignores all print requests. When DTR from printer is ON, DSR shows printer status. If DTR is OFF, terminal assumes that printer can't receive characters. If DTR is ON again, print operation completes. |
| 7 | SIGNAL GROUND (SGND) | 102/AB | SGND is common ground for all voltages on interface. |
| 20 | DATA TERMINAL READY (DTR) | 108.2/C | FROM VA 120 DTR is on when terminal is ON. Printer usually receives DTR as DSR. Usually printer operation can begins after DTR is ON. |

2. PRINTER SERIAL CHARACTERS

A 7-bit serial characters transmitted using a start bit, 7 or 8 data bits are used for communication between the VA 120 terminal and the serial printer. An optional parity bit, and one or two stop bits. When the data bits

are transmitted, the least significant bit is transmitted first.

When characters of 8 parity bits are selected, the last data bit is ignored when received. If selected for no parity, there is no parity bit transmitted. The speed (Baud rate) is also selected in **SET-UP**.

VA 120 Specification

I. FEATURES

1. DISPLAY

- *STANDARD CHARACTER SETS: 128 ASCII, 32 SPECIAL GRAPHICS AND LINE DRAWING GRAPHICS
- *EXTRA CHARACTER SETS: U.K.
- *DOUBLE SIZE CHARACTERS ON COMMAND
- *7x9 CHARACTER DDT MATRIX
- *DUAL INTENSITY, BLINKING, UNDERLINE, REVERSE VIDEO (SELECTABLE FOR EACH CHARACTER)
- *NORMAL OR REVERSE VIDEO (SELECTABLE FOR WHOLE SCREEN)
- *SMOOTH SCROLL OR JUMP SCROLL
- *SPLIT SCREEN OPERATION
- *BRIGHTNESS CONTROLLED FROM KEYBOARD
- *SCREEN SAVER

2. KEYBOARD

- *LOW-PROFILE, ERGONOMIC DESIGN
- *KEYCAP: STANDARD SLOPE TYPE KEYCAP OR SCULPTURE KEYCAP
- *KEYSWITCH: TACTILE OR NON-TACTILE
- *13-KEY NUMERIC PAD
- *KEY-CLICK ON/OFF
- *7 LED INDICATORS FOR ON LINE, LOCAL, KEYBOARD-LOCKED, INSERT AND EDIT, DSR, CTS SIGNAL.

3. FUNCTIONS

- *SET-UP A/B/C MODES
- *ERASING AND EDITING COMMANDS
- *PROTECTED FIELD AND BLOCK TRANSMISSION
- *XON/XOFF PROTOCOLS

4. PRINTING

- *RS-232C SERIAL PRINTER PORT --- BI-DIRECTIONAL
- *ANSI AUTO-PRINT PRINTER CONTROLLER MODES
- *XON/XOFF PROTOCOL

5. FIRMWARE COMPATIBILITY

- *DEC VT 100/VT 131 COMPATIBLE

II. TECHNICAL DATA

1. MONITOR

- *SCREEN CAPACITY: 24x80 (1920 CHARACTERS) OR 24x132 (3168 CHARACTERS)
- *CRT SCREEN: 12" (30.5 cm) DIAGONAL P31 PHOSPHOR WITH NON-GLARE SURFACE (P4/PC 134 OPTIONAL)
- *CHARACTER FIELD: 9x12

2. DATA FORMAT

- *DATA BITS: 8 OR 7, ASYNCHRONOUS
- *PARITY: ODD, EVEN, MARK, SPACE OR NONE
- *STOP BITS: 1 OR 2
- *DATA RATE: 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 4800, 9600, 19200 BITS/SEC. (KEYBOARD SELECTABLE)

3. INTERFACES

- *RS-232C
- *20MA CURRENT LOOP
- *RS-422A

4. PHYSICAL SPECIFICATIONS

- *TILT: 10 (FORWARD)/5(BACKWARD) DEGREES
- *SWIVEL: 30 (LEFT/RIGHT)

- *POWER REQUIREMENTS SWITCHING MODE
115V/220V/230V/240V

50/60HZ

- *AMBIENT TEMPERATURE:
10°C TO 40°C (OPERATING)
—10°C TO 60°C (STORAGE)

- *RELATIVE HUMIDITY
10% TO 85% NON-CONDENSING

- *NET WEIGHT: 10.5 KG, GROSS WEIGHT: 13.2KG (CARTON)

5. DIMENSIONS

- *DISPLAY UNIT
WIDTH: 321MM
DEPTH: 365MM
HEIGHT: 356MM

- *KEYBOARD
WIDTH: 446MM
DEPTH: 205MM
HEIGHT (REAR): 45MM
HEIGHT (FRONT): 18MM

PROGRAMMING SUMMARY

| NAME | CHARACTER MNEMONIC | HEX CODE | FUNCTION |
|------------------------|-----------------------|-------------|---|
| NULL | NUL | 0 | Ignored when received (not stored in input buffer) and used as a fill character. |
| END OF TEXT | ETX | 3 | Can be selected as a half-duplex turnaround character. |
| END OF TRANSMISSION | EOT | 4 | Can be selected as a disconnect character or half-duplex turnaround character. When used as a turnaround character, the disconnect character is DLE-EOT. |
| ENQUIRE | ENQ | 5 | Transmits answerback message. |
| BELL | BEL | 7 | Bell tone. |
| BACKSPACE | BS | 8 | Moves cursor to the left one character position: if cursor is at left margin, no action occurs. |
| HORIZONTAL | HT | | Moves cursor to next tab stop, or to right margin if there are no more tab stops. |
| TAB | VT | 09 | <p>In EDIT mode, the TAB character positions the cursor, and the character is not held in memory. When the character is received, the cursor moves to one of the following locations.</p> <p>Next TAB stop</p> <p>Next field boundary (if erasure mode is set)</p> <p>Next unprotected field (if erasure mode is reset)</p> <p>First unprotected character position in the scrolling region (if the cursor is above the scrolling region)</p> <p>Last character position of the screen (if the cursor is below the scrolling region)</p> <p>In EDIT mode, a TAB received with no more TAB stops or fields, causes the cursor to move to the end of the screen region.</p> |
| LINEFEED | LF | 0A | Causes a linefeed or a new line operation. (See linefeed/new line mode.) Also causes printing if auto print operation selected. |
| VERTICAL TAB | VT | 0B | Processed as LF. |
| FORM FEED | FF | 0C | Processed as LF. FF can also be selected as a half-duplex turnaround character. |
| CARRIAGE RETURN | CR | 0D | Moves cursor to left margin on current line. CR can also be selected as a half-duplex turnaround character. |
| SHIFT OUT | SO | 0E | Selects G1 character set designated by a select character set sequence. |

| NAME | CHARACTER MNEMONIC | HEX CODE | FUNCTION |
|---------------------|-----------------------|-------------|---|
| SHIFT IN | SI | 0F | Selects G0 character set designated by a select character set sequence. |
| DEVICE CONTROL 1 | DC1 | 11 | Processed as XON. DC1 causes terminal to continue transmitting characters. |
| DEVICE CONTROL 3 | DC3 | 13 | Processed as XOFF. DC3 causes terminal to stop transmitting all characters except XOFF and XON. DC3 can also be selected as a half-duplex turnaround character. |
| CANCEL | CAN | 18 | If received during an escape or control sequence, cancels the sequence and displays substitution character. |
| SUBSTITUTE | SUB | 1A | Processed as CAN. |
| ESCAPE | ESC | 1B | Processed as a sequence leading code. |

ANSI COMPATIBLE SEQUENCES

SET MODE

| NAME | MNEMONIC | MODE | SEQUENCE |
|-----------------------|----------|-------------|-------------|
| GUARDED AREA TRANSFER | GATM | ALL | ESC [1 h |
| KEYBOARD ACTION | KAM | LOCKED | ESC [2 h |
| INSERTION-REPLACEMENT | IRM | INSERT | ESC [4 h |
| ERASURE | ERM | ALL | ESC [6 h |
| SEND-RECEIVE | SRM | OFF | ESC [1 2 h |
| TRANSFER TERMINATION | TTM | FULL PAGE | ESC [1 6 h |
| LINEFEED/NEW LINE | LMN | NEW LINE | ESC [2 0 h |
| CURSOR KEY | DECCKM | APPLICATION | ESC [? 1 h |
| ANSI/VT52 | DECANM | ANSI | N/A |
| COLUMN | DECCOLM | 132 COLUMN | ESC [? 3 h |
| SCROLLING | DECSCLM | SMOOTH | ESC [? 4 h |
| SCREEN | DECSCNM | REVERSE | ESC [? 5 h |
| ORIGIN | DECOM | RELATIVE | ESC [? 6 h |
| AUTO WRAP | DECAWM | ON | ESC [? 7 h |
| AUTO REPEAT | DECARM | ON | ESC [? 8 h |

| NAME | MNEMONIC | MODE | SEQUENCE | | | | | |
|---------------------------------------|----------|-------------|----------|---|---|---|---|---|
| EDITING | DECEDM | EDIT | ESC | [| ? | 1 | 0 | h |
| LINE TRANSMIT | DECLTM | ON | ESC | [| ? | 1 | 1 | h |
| SPACE COMPRESSION/ FIELD DELIMITER | DECSCFOM | ON | ESC | [| ? | 1 | 3 | h |
| TRANSMIT EXECUTION | DECTEM | IMMEDIATE | ESC | [| ? | 1 | 4 | h |
| EDIT KEY EXECUTION | DECEKEM | IMMEDIATE | ESC | [| ? | 1 | 6 | h |
| PRINT FORM FEED | DECPFF | ON | ESC | [| ? | 1 | 8 | h |
| PRINT EXTENT | ESCPEX | FULL SCREEN | ESC | [| ? | 1 | 9 | h |

RESET MODE

| NAME | MNEMONIC | MODE | SEQUENCE* | | | | | |
|---------------------------------------|----------|------------------|-----------|---|---|---|---|---|
| GUARDED AREA TRANSFER | GATM | UNPROTECTED | ESC | [| 1 | 1 | | |
| KEYBOARD ACTION | KAM | UNLOCKED | ESC | [| 2 | 1 | | |
| INSERTION-REPLACEMENT | IRM | REPLACE | ESC | [| 4 | 1 | | |
| ERASURE | ERM | UNPROTECTED | ESC | [| 6 | 1 | | |
| SEND-RECEIVE | SRM | ON | ESC | [| 1 | 2 | 1 | |
| TRANSFER TERMINATION | TTM | SCROLLING REGION | ESC | [| 1 | 6 | 1 | |
| LINEFEED/NEW LINE | LMN | LINEFEED | ESC | [| 2 | 0 | 1 | |
| CURSOR KEY | DECCKM | CURSOR | ESC | [| ? | 1 | 1 | |
| ANSI/VT 52 | DECANM | VT 52 | ESC | [| ? | 2 | 1 | |
| COLUMN | DECCOLM | 80 COLUMN | ESC | [| ? | 3 | 1 | |
| SCROLLING | DECSCLM | JUMP | ESC | [| ? | 4 | 1 | |
| SCREEN | DECSCNM | NORMAL | ESC | [| ? | 5 | 1 | |
| ORIGIN | DECOM | ABSOLUTE | ESC | [| ? | 6 | 1 | |
| AUTO WRAP | DECAWM | OFF | ESC | [| ? | 7 | 1 | |
| AUTO REPEAT | DECARM | OFF | ESC | [| ? | 8 | 1 | |
| EDITING | DECEDM | INTERACTIVE | ESC | [| ? | 1 | 0 | 1 |
| LINE TRANSMIT | DECLTM | OFF | ESC | [| ? | 1 | 1 | 1 |
| SPACE COMPRESSION/ FIELD DELIMITER | DECSCFDM | OFF | ESC | [| ? | 1 | 3 | 1 |
| TRANSMIT EXECUTION | DECTEM | DEFERRED | ESC | [| ? | 1 | 4 | 1 |
| EDIT KEY EXECUTION | DECEKEM | DEFERRED | ESC | [| ? | 1 | 6 | 1 |
| PRINT FORM FEED | DECPFF | OFF | ESC | [| ? | 1 | 8 | 1 |
| PRINT EXTENT | DECPEX | SCROLLING REGION | ESC | [| ? | 1 | 9 | 1 |

* Hex Code for 1 is 6c

CURSOR KEY CODES GENERATED

CURSOR KEY (ARROW)

UP
DOWN
RIGHT
LEFT

RESET (CURSOR)

ESC [A
ESC [B
ESC [C
ESC [D

ANSI CHARACTERS GENERATED

SET (APPLICATION)

ESC O A
ESC O B
ESC O C
ESC O D

CHARACTER ATTRIBUTES

NAME

Select Graphic Rendition
(No Attributes)
Select Graphic Rendition
(No Attributes)
Select Graphic Rendition
(Select Attribute Bold)
Select Graphic Rendition
(Select Attribute Underline)
Select Graphic Rendition
(Select Attribute Blink)
Select Graphic Rendition
(Select Attribute, Reverse Video)

MNEMONIC

SGR
SGR
SGR
SGR
SGR
SGR

SEQUENCE

ESC [m
ESC [0 m
ESC [1 m
ESC [4 m
ESC [5 m
ESC [7 m

SCROLLING REGION

NAME

Set Top and Bottom Margins

MNEMONIC

DECSTBM

SEQUENCE

ESC [P_t ; P_b r

CURSOR MOVEMENT COMMANDS

NAME

MNEMONIC

SEQUENCE

| NAME | MNEMONIC | SEQUENCE |
|---|----------|------------------------|
| Cursor Up | CUU | ESC [P _n A |
| Cursor Down | CUD | ESC [P _n B |
| Cursor Forward (Right) | CUF | ESC [P _n C |
| Cursor Backward (Left) | CUB | ESC [P _n D |
| Cursor Position | CUP | ESC [Pl; Pc H |
| Cursor Position (Home) | CUP | ESC [H |
| Horizontal and Vertical Position | HVP | ESC [Pl; Pc f |
| Horizontal and Vertical Position (Home) | HVP | ESC [f |
| Index | IND | ESC D |
| Reverse Index | RI | ESC M |
| Next Line | NEL | ESC E |
| Save Cursor (and Attributes) | DECSC | ESC 7 |
| Restore Cursor (and Attributes) | DECRC | ESC 8 |

CHARACTER PROTECTION

| NAME | MNEMONIC | SEQUENCE |
|--|----------|---------------|
| Protected Field Attributes (No Protection) | DECPRO | ESC [0 } |
| Protected Field Attributes (Bold Protection) | DECPRO | ESC [1 } |
| Protected Field Attributes (Underline Protection) | DECPRO | ESC [4 } |
| Protected Field Attributes (Blink Protection) | DECPRO | ESC [5 } |
| Protected Field Attributes (Reverse Video Protection) | DECPRO | ESC [7 } |
| Protected Field Attributes (All Attributes Off Protection) | DECPRO | ESC [2 5 4 } |

* Hex Code for] is 7 D.

TRANSMISSION REQUEST

| NAME | MNEMONIC | SEQUENCE |
|--------------------|----------|----------|
| Set Transmit State | STS | ESC S |

TRANSMISSION ENABLE

| NAME | MNEMONIC | SEQUENCE |
|----------|----------|----------|
| Transmit | DECXMIT | ESC 5 |

END OF BLOCK CHARACTER

| NAME | MNEMONIC | SEQUENCE* |
|--|----------|-----------|
| Transmit Termination Character (Function Disabled) | DECTTC | ESC [0 |
| Transmit Termination Character (Form Feed, FF) | DECTTC | ESC [1 |
| Transmit Termination Character (End of Text, ETX) | DECTTC | ESC [2 |
| Transmit Termination Character (End of Transmission, EOT) | DECTTC | ESC [3 |
| Transmit Termination Character (Carriage Return, CR) | DECTTC | ESC [4 |
| Transmit Termination Character (Device Control 3, DC3) | DECTTC | ESC [5 |

* Hex Code for | is 7C.

VT52 MODE

ERASING

| NAME | SEQUENCE |
|------------------------|----------|
| Erase to End of Line | ESC K |
| Erase to End of Screen | ESC J |

PRINT COMMANDS

| NAME | SEQUENCE |
|-------------------------------|----------|
| Enter Auto Print Mode | ESC A |
| Exit Auto Print Mode | ESC - |
| Enter Printer Controller Mode | ESC W |
| Exit Printer Controller Mode | ESC X |
| Print Screen | ESC] |
| Print Cursor Line | ESC V |

REPORTS

| NAME | SEQUENCE |
|-------------------------|----------|
| Identify (What Are You) | ESC Z |
| Response: VA120 | ESC /Z |

WARNING

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Sub-part J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

